

LANNUAL REPORT

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KAIST INSTITUTE





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Public Charity and Social Activities

- Establishment of Chunghi & Byiung Jun Park Korea-US Female Engineer Scholarship
- Establishment of Chunghi & Byiung Jun Park Scholarship Funds for Chuncheon Girls' High School
- Establishment of Marine Scholarship Foundation in Chuncheon Province
- Donation of funds for the construction of Chunghi & Byiung Jun Park Innovation Lecture Room at MIT
- Artemis G. Pazianos M.D. Research Funds provided to Lahey Clinic in the US
- Chunghi & Byiung Jun Park Scholarship Funds provided to MIT
- Establishment of Chunghi & Byiung Jun Park Scholarship Foundation for Seoul National University High School
- Chunghi & Byiung Jun Park Cancer Research and Education Center established at Lahey Clinic
- Chunghi & Byiung Jun Park Development Funds provided to the Department of Engineering, Seoul National University
- Research Funds provided to Tufts University
- Research Funds provided to the University of Connecticut
- Development Funds provided to KAIST for the construction of (Chunghi & Byiung Jun Park KAIST Institutes Building)

Dr. Byiung Jun (BJ) Park is a successful entrepreneur and international businessman. Interested in textiles and the mechanical properties of fabric, Dr. Park attended the Rhode Island School of Design for textile engineering, then MIT for his SM degree in Mechanical Engineering, and finally Leeds University for a PhD degree in textile engineering. Dr. Park founded a highly 18_ KAIST INSTITUTE ANNUAL REPORT

Contributors

Donations for the Future of KAIST

Dr. Byiung Jun Park and his wife, Ms. Chunghi Park generously donated 10 million dollars in 2007 for the construction of the KI Building in hopes that KAIST would become the greatest university in the world. Based on their wish, the construction of the KI Building was completed in 2010. At present, around 400 professors, researchers, and graduate students are working in this beautiful research space, fully devoting themselves to the development of impactful innovative technologies.



successful company called Merchandise Testing Laboratories (MTL) in Brockton, MA in 1988, which grew to become a global leader in consumer product testing, inspection, and social accountability for products shipped to the US from overseas. Under his leadership, MTL garnered prestigious customers such as Ann Taylor, the Gap, Target, and other noteworthy retailers,

manufacturers, and importers with product testing operation locations worldwide. In May 2001, MTL was successfully acquired by the \$1.3 billion international quality and safety assurance giant, Bureau Veritas. Dr. Park was a member of KAIST President's Advisory Council from 2007 to 2012, and a member of the KAIST Board Directors from 2009 to 2012.

Greetings

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Congratulations to the KAIST Institute for Major Achievements

One of the primary reasons we do research at universities is to improve the quality of life of people. Modern advances in life sciences, computer science, materials science, mechanical and electrical engineering, telecommunications, brain science, environment, food sciences, robotics, artificial intelligence, design, and other fields all have contributed toward this goal. This quest for better quality of life for all human beings will continue to drive academic research as in the past.

The issues in many of these fields are complex, often requiring multi- or cross-disciplinary approaches. The KAIST Institute(KI) is in a unique position to achieve these human aspirations. KI is the place where intelligent and hard-working people with expert knowledge gather together to confront the challenges of our times, sharing knowledge and working together.

KI has made major advances in its quest to achieve its original goals. These contributions are widely admired worldwide. However, in research, the goalposts continue to move forward, challenging the best minds from all disciplines at all times. The more progress we make, the greater challenges lie ahead. Through its continuing quests and creative research, KI is in a position to make major strides and contributions for humanity worldwide.

In the 21st century, there are many nascent areas of science and technology which challenge our imagination. For instance, one of these fields is related to the brain. How does the brain function? How does it store information for so many decades? How does it process information and coordinate motions? What is the cause of autism? How about Alzheimer's? Many questions related to the brain are challenging our knowledge and imagination. There are many other fields that are equally challenging and will be rewarding for KAIST and humanity. KI has done pioneering work in some of these challenging fields. The multi-disciplinary research done in KI is what Dr. and Mrs. BJ Park had in mind when they provided their generous support.

My congratulations to the members of KI, and I wish you a continuing success.

 $\begin{array}{c} \text{Suh, Nam Pyo} \\ 13^{\text{th}} \text{ and } 14^{\text{th}} \text{ President of KAIST} \end{array}$

I wish tremendous success for KAIST Institute

Reading the report from KAIST Institute makes me feel like I have opened a treasure box filled with outstanding results. Since my work at KAIST as the president was finished and I returned to the University of California, it always makes me so proud of KAIST to hear many people talk about its excellence.

Convergence research in biotechnology, IT, robotics, nano, health science, and AI fields that play an important role in the future of KAIST Institute, the CO_2 Management Center for continuous environmental improvement, and the Fourth Industrial Revolution Intelligence Center (FIRIC) may confer great benefits internationally as well as domestically.

Today's world sees unprecedented development with big data analytics and applications driven by rapid computing and communication networks. The smartphones that people carry today are more intelligent than the huge supercomputers of the 1980s. They even have biosensors to measure blood pressure and electrocardiograms, and can direct an ambulance to the correct location in an emergency. This was made possible by the convergence research in various fields as mentioned earlier. As today is the first day of the future, current research results are the mere starting points of future research. That is why we should accelerate the convergence research of KAIST.

KAIST Institute has been delivering outstanding results thanks to its global-level research administration, excellent researchers, devoted staff, and the support of many donors, including Dr. Byiung Jun (BJ) Park and Mrs. Chunghi Park. I hope KAIST will continue to create great value-added scientific contributions with strategic research based on a high vision and exemplary research ethics.

I expect KAIST to contribute greatly to industrial development and the cultivation of graduate students who will become future researchers, and ask for continuous support from you as well as the government. The image of researchers who work passionately is still vivid to me, and I miss the test beds.

Sung-Mo Kang, 15th President of KAIST Greetings

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President's Greetings for 2018 KAIST Institute Annual Report

Established in 1971 as the first research-oriented graduate school, KAIST has contributed to advancing the industrialization and informatization of Korea. KAIST has gained global recognition today as a world-class university in the strenuous pursuing of innovation and excellence.

In preparation for the Fourth Industrial Revolution, KAIST seeks to become a Global Value-Creative Leading University under Vision 2031. It will contribute to global happiness and prosperity by fostering multidisciplinary talent and creating knowledge with global impact.

To fulfill Vision 2031, KAIST Institute (KI) will implement an advanced R&D system to engage in the world's best, first or only research of its kind to overcome challenges faced by humanity and maximize academic, technical, and economic value.

KI features six research institutes and one center; KI for BioCentury, KI for IT Convergence, KI for Robotics, KI for NanoCentury, KI for Health Science and Technology, KI for Artificial Intelligence, and the Saudi Aramco-KAIST CO₂ Management Center. They are actively involved in multidisciplinary research in pivotal areas of the Fourth Industrial Revolution. In addition, through the newly established Fourth Industrial Revolution Intelligence Center (FIRIC), KAIST will implement global strategies to mature into an exemplary institute and present a model for success in the Fourth Industrial Revolution.

KAIST will build a brighter future for Korea and beyond, ultimately overcoming challenges of today and tomorrow. KI will be the central place for strenuous multidisciplinary research, helping to achieve KAIST's mission and vision.

KI looks forward to your interest and support, and promises to continue playing an instrumental role in producing groundbreaking technology.

Sung-Chul Shin, President of KAIST



We will lead the world's best convergence and meta-convergence research for mankind and the environment. KAIST Institute (KI) has been conducting leading convergence research for the future of mankind. Since its establishment in 2006, the KI has been evolving with continuous innovations. As a premier interdisciplinary research institute, KI has been putting much effort into discovering new growth engines based on convergence research that breaks down boundaries between disciplines. KI currently comprises six research institutes on biotechnology, information and communication technology, robotics, nanotechnology, health science and engineering, and artificial intelligence. Each institute has been conducting interdisciplinary research on its core theme by identifying and solving the most important problems. As summarized in this annual report, all six institutes are leading their respective fields through the development of new technologies with not only academic excellence but also industrial significance.

In this era of the Fourth Industrial Revolution, there is no doubt that convergence research will play an even more important role in establishing new technologies for the benefit of mankind. With an aim to develop core competence technologies, KI launched the Network of Excellence for the Fourth Industrial Revolution (NExFIRE) projects in 2018. Under the NExFIRE framework, KI has been conducting convergence and meta-convergence research on a variety of important topics including degenerative brain disease, AI-based advancement of healthcare, and molecular printers, addressing the most tantalizing problems of mankind. In addition, the Fourth Industrial Revolution Intelligence Center (FIRIC) has initiated studies not only on the trends in key technological fields leading the Fourth Industrial Revolution such as block chain, precision medicine and AI, but also on their societal and economic impacts in the context of human-centered and fair applications. It should be noted that KAIST, through the KI, is the only university in the world that has a formal partnership MOU with the World Economic Forum (WEF).

More recently, KI has been promoting meta-convergence research that further harmonizes technologies to play a leading role in the rapidly changing world in the future. In particular, the Meta-Convergence Building, high-tech meta-convergence research facilities that will create a fully flexible research environment as KI2, will be built on the KAIST campus by 2022. With the same spirit of convergence-based open innovation, the Meta-Convergence Building will provide a creative and free research atmosphere and transform KI into a world-class center of convergence research. As a leading place of convergence research, we will continue to make every effort to faithfully help establish a better world for all. We look forward to receiving your continued interest, encouragement and support. Thank you.

Sang Yup Lee, Distinguished Professor and Dean of KAIST Institutes

KAIST Institute Overview

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KI for Robotics



Oh, Jun-Ho jhoh8@kaist.ac.kr

KI for the NanoCentury



heetae@kaist.ac.kr

KI for the BioCentury Vision Century

Mission

Core

Mission

Vision

Core

Competence

Competence



Kim, Sun Chang sunkim@kaist.ac.kr

KI for IT Convergence



Cho, Gyuseong Director gscho1@kaist.ac.kr

KI for the BioCentury plays a central role in the field of bio-fusion research, achieving world-class research outcomes and creating a new growth engine for national development.

KI for the BioCentury was established with the goal of combining various related disciplines into one core field based on research capacity in bio-fusion. KI for the BioCentury has focused on the development of excellent research capacity by considering global trends and has helped to realize a creative bio-industry through new interdisciplinary research and academic interfaces in order to lead the global market.

Cancer Metastasis Control

- R&D of mechanisms, targets, and bio-markers for the metastasis of cancer
- Establishment of the base for the development of new medicines through the structural analysis of targets to control cancer metastasis
- Analysis of the effect of natural products on cancer metastasis Innovative Technology Center for Novel Biomaterials
- Design of artificial synthetic genomes for the development of highly

Brain cognitive function control

- Understanding the fundamental neural mechanisms underlying brain cognitive functions
- Developing innovative therapeutical approaches for restoring impaired brain cognitive functions

Human Microbiome Control

- Understanding the human microbiome patterns underlying ageing process and related diseases
- Developing innovative analysis tools for elucidating human microbiome patterns
- Developing next-generation therapeutic approaches for the healthy aging

KAIST Institute for Information Technology Convergence conducts globalleading multidisciplinary research and industrialization with the aid of information technologies.

- Cultivate global-leading multidisciplinary research groups including full-time researchers, students, and professors
- Create open innovation environments with complementary roles of departments in KAIST

B5G/6G mobile communications and wireless power transfer technology

- Antenna/RF/Beamforming technology
- Millimeter band technology
- RF wireless power transfer technology

IoT/WoT

- IoT/WoT interworking framework
- IoT data stream analysis / machine learning for situation awareness
- Augmented Reality · Augmented Human
- Virtual Reality / Digital Twin

Integrated sensors

- Smart integrated sensors and networks
- Mobile healthcare sensors
- Application technology of SiPM (Silicon photomultiplier)





KAIST Institute Overview	Research Highlights	Research Achievements	Faculty Information							
Vission	 Focuses on the resea operate in real world Promotes synergy of engineering, mech- engineering and cor 	rch toward highly intelliger n interdisciplinary collabor anical engineering, aeros nputer science.	nt robots that can reliably ration between electrical space engineering, civil							
/ision	• Robots that think!									
Core Competence	 RTOS for Humanoid Robots Development of intelligent real-time robot operating system for accurate humanoid control Software architecture that allows multiple developers can simultaneously program 									
	Al for Cooperative Robots Research on of learning algorithms for AI Coordination of multiple/heterogeneous unmanned agents Mobile intelligence									
	 Development of mobile ro Active real-time SLAM an 	bot platforms d recognition techniques								

Aission	With an aim to promote and advance the multidisciplinary nature of nanotechnology, KI for the NanoCentury targets on becoming a globally leading laboratory in various fields of nanotechnology by creatively overcoming the boundaries of different areas.
lision	The World-Leading University Hub of Nano Convergence Research
	 Fusion Research for Synergistic Effects Win-Win through Cooperation
ore	NT for Climate Change
ompetence	Nanotechnology for Advanced Battery
	Nanotechnology for Environmental Applications, Water, Fine dust
	 Nanotechnology for Sustainable Energy Efficient Nano-Processes for CO₂ Emission
	NT for Healthcare
	Nano-Sensor Technology
	Nanotechnology Systems for Diagnosis of Infections
	NT for Advanced Opto-Electronics
	Nanotechnology for Advanced 3D Display
	 Nanotechnology for Wearable Electronics
	 Nanotechnology for Next-generation Semiconductor

KAIST Institute Overview

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KI for Health Science and Technology aims to develop new high-impact

Saudi Aramco-KAIST CO₂ Management Center



Lee, Jay Hyung Director jayhlee@kaist.ac.kr

Fourth Industrial Revolution Intelligence Center(FIRIC)





KI fe	or Health Science Technology	Vision
KIHST	Jeong, Yong Director yong@kaist.ac.kr	Core Competence

Mission

Mission

Vision

Core

Competence





Lee, Soo-Young Director sy-lee@kaist.ac.kr

 Development of innovative futuresearch of medicine and enginee 	re healthcare technology through interdisciplinary ring
 Frontier in future healthcare indu academia, hospital and industry R 	ustry and market through synergistic partnership o &D activity in the field of health science
Neuroimaging & Neuromodulat	ion
 Neuroimaging-based brain networ Imaging Biomarker and neuromody 	k and nemodynamics analysis ulation for neurodegenerative diseases
Model-based emotion perception Milimeter based pen investive variable	
Millimeter-based non-invasive vagu	is nerve stimulation
Cutting-edge Intravital microscopy	/ endo-microscopy
Laser-holography-based high-resol	ution imaging
 Advanced photo-therapy for human Clinical optical imaging system 	n disease
 Biological analysis of tumor microe 	environments
Targeted nanomedicine for cancer	therapy
Cooperative tumor cell membrane	targeted phototherapy
Smart Healthcare	1.9.1.10
 Development of key technology for Establishment of mobile healthcare 	e ecosystem and its validation
 Digital Phenotype for Personal Phy 	
By developing innovative AI T	sical and Mental Healthcare Service
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv nce Research Institute via development of artificia ic enabling technologies.
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv nce Research Institute via development of artificia ic enabling technologies.
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of Virian (space based multimodel space)	sical and Mental Healthcare Service Cechnologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv nce Research Institute via development of artifici ic enabling technologies.
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of • Vision/speech based multimodal re • Natural language processing, under	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv nce Research Institute via development of artifici ic enabling technologies. computation architecture and learning rule presentation, cognition and interaction erstanding, generation and conversation
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of • Vision/speech based multimodal re • Natural language processing, unde • Understanding and computational	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv nce Research Institute via development of artifici ic enabling technologies. computation architecture and learning rule presentation, cognition and interaction rrstanding, generation and conversation model of Human internal states
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of • Vision/speech based multimodal re • Natural language processing, unde • Understanding and computational (such as Intention, Emotion, Trust, N • Human-like situation awareness, ju	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv nce Research Institute via development of artifici ic enabling technologies. computation architecture and learning rule presentation, cognition and interaction restanding, generation and conversation model of Human internal states Memory, Ethics, and Personality) udgement and behavior modeling
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of • Vision/speech based multimodal re • Natural language processing, unde • Understanding and computational (such as Intention, Emotion, Trust, N • Human-like situation awareness, ju AI Applications	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv Ince Research Institute via development of artifici ic enabling technologies. computation architecture and learning rule presentation, cognition and interaction restanding, generation and conversation model of Human internal states <i>Memory</i> , Ethics, and Personality) udgement and behavior modeling
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of • Vision/speech based multimodal re • Natural language processing, unde • Understanding and computational (such as Intention, Emotion, Trust, N • Human-like situation awareness, ju AI Applications • Intelligent service agents	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv nce Research Institute via development of artifici ic enabling technologies. computation architecture and learning rule presentation, cognition and interaction restanding, generation and conversation model of Human internal states Memory, Ethics, and Personality) udgement and behavior modeling
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals Brain-inspired cognitive inference of Vision/speech based multimodal re Natural language processing, unde Understanding and computational (such as Intention, Emotion, Trust, N Human-like situation awareness, ju AI Applications Intelligent service agents Solutions for natural science and e	Sical and Mental Healthcare Service Sechnologies for the human "Quality-of-Life ate to the 4 th Industrial Revolution and servi- ince Research Institute via development of artifici- ic enabling technologies. Computation architecture and learning rule presentation, cognition and interaction erstanding, generation and conversation model of Human internal states Memory, Ethics, and Personality) idgement and behavior modeling ngineering problems
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of • Vision/speech based multimodal re • Natural language processing, unde • Understanding and computational (such as Intention, Emotion, Trust, N • Human-like situation awareness, ju AI Applications • Intelligent service agents • Solutions for natural science and e • Medicine and Healthcare • Intelligent Robot/drone and autom	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ute to the 4th Industrial Revolution and serv Ince Research Institute via development of artifici- ic enabling technologies. computation architecture and learning rule presentation, cognition and interaction terstanding, generation and conversation model of Human internal states Memory, Ethics, and Personality) idgement and behavior modeling ngineering problems production and states
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of • Vision/speech based multimodal re • Natural language processing, unde • Understanding and computational (such as Intention, Emotion, Trust, N • Human-like situation awareness, ju AI Applications • Intelligent service agents • Solutions for natural science and e • Medicine and Healthcare • Intelligent Robot/drone and automo	sical and Mental Healthcare Service Technologies for the human "Quality-of-Life ate to the 4th Industrial Revolution and serv Ince Research Institute via development of artific ic enabling technologies. computation architecture and learning rule presentation, cognition and interaction restanding, generation and conversation model of Human internal states Memory, Ethics, and Personality) udgement and behavior modeling ngineering problems pomous vehicle psition
By developing innovative AI T improvement, we will contribu as AI hub and Think Tank. World top class Artificial Intelliger intelligence core and domain-specifi AI Fundamentals • Brain-inspired cognitive inference of • Vision/speech based multimodal re • Natural language processing, unde • Understanding and computational (such as Intention, Emotion, Trust, N • Human-like situation awareness, ju AI Applications • Intelligent service agents • Solutions for natural science and e • Medicine and Healthcare • Intelligent Robot/drone and automo • Design of new material and compo • Management and finance	Sical and Mental Healthcare Service Sechnologies for the human "Quality-of-Life ate to the 4 th Industrial Revolution and servi- ince Research Institute via development of artifici- ic enabling technologies. Computation architecture and learning rule presentation, cognition and interaction restanding, generation and conversation model of Human internal states Memory, Ethics, and Personality) udgement and behavior modeling ngineering problems product of the service of the service of the service provide of the service of the ser

- Environment forecasting system
- etc.

 Smart chip • Quantum machine learning

KAIST Institute Overview	Research Highlights	Research Achievements	Faculty Information
Mission	Research activities of th capturing CO ₂ and innov important area of rese chemicals and materials i	is center have primar ative methods of red arch is the transfor n an economically-fea	ily focused on the process of ucing CO ₂ emissions. Another mation of CO ₂ into valuable asible manner.
Vision	 Within 10 years of its esta will become one of the wor By focusing on the convers the Saudi Aramco-KAIST O landscape of CO₂ research. Various technology rights w Commercialization will be p 	blishment, Saudi Aramc ld's most recognized rese ion of CO_2 into high valu CO_2 Management Center with high potential comme promoted through collabo	o-KAIST CO ₂ Management Center earch centers in the field. ue-added materials and chemicals, will build a unique identity in the ercial power will be obtained. oration with Saudi Aramco.
Core Competence	CO ₂ Avoidance using effici • Auxiliary power units using • Supercritical CO ₂ based both	ency improvement direct liquid hydrocarbon coming cycle	SOFC
	CO ₂ Capture - Advanced materials for (• Porous solids (MOFs, COFs, • Advanced solvents (ILs, Amin • Functional sorbent	CO2 capture COPs) ne-based)	
	CO ₂ Conversion - Efficient processes for C • Photo/electro-chemical appr • Homogenous catalysis • Mineralization & carbonizat • Carbonization of cement us	CO O ₂ conversion • R roach ion ing CO ₂	² Storage esilient geologic storage of CO ₂
Mission	Monitoring of merging te and the research and p cultural impacts of those	chnologies driving th olicy development o technologies	e Fourth Industrial Revolution n the social, economic, and
Vision	A global strategic research leading the Fourth Industrial	center for the co-design Revolution	ning of technologies and policies
Core Competence	 Collaborative research wit medicine) Publication of trends of 4IR Operation of a consultative a preferenced network data 	h WEF C4IR on three co core technologies report a group with research instit	re topics(AI, blockchain, precision and issue papers tutes and researchers and launch of

• Participation in domestic and international policy discussions and joint meetings

KAIST Institute Overview

KAIST Institute Statistics

• Faculty

(As of Dec 2018)

	KIB	КІІТС	KIR	KINC	KIHST	KIAI	CO ₂	Total
Professor	29	14	7	93	34	31	21	229
Research Professor (KI Fellow)	4	3 (1)	-	1 (1)		-	-	8 (2)
Adjunct Professor	-	8	-	-	-	-	-	8
Total	33	25 (1)	7	94 (1)	34	31	21	245 (2)

• Papers - Total (SCI)

	KIB	КІІТС	KIR	KINC	КІНЅТ	KIAI	CO ₂	Total
2008	19 (19)	23 (3)	17 (1)	17 (17)	68 (68)	-	-	144 (108)
2009	16 (16)	20 (6)	2 (0)	7 (7)	139 (34)	-	-	184 (63)
2010	75 (71)	-	7 (1)	11 (11)	53 (49)	-	-	146 (132)
2011	7 (0)	-	10 (0)	9 (9)	12 (12)	-	-	38 (21)
2012	3 (3)	18 (5)	84 (20)	28 (18)	49 (45)	-	-	182 (91)
2013	15 (14)	34 (10)	87 (17)	75 (71)	42 (34)	-	-	253 (146)
2014	54 (19)	21 (9)	106 (28)	69 (43)	180 (61)	-	1 (1)	431 (161)
2015	32 (29)	10 (8)	40 (34)	69 (63)	70 (66)	-	2 (2)	223 (202)
2016	75 (74)	37 (35)	22 (21)	49 (47)	56 (52)	-	12 (11)	251 (240)
2017	53 (50)	45 (34)	23 (21)	66 (65)	66 (62)	2 (2)	23 (17)	278 (251)
2018	119 (119)	45 (41)	49 (43)	180 (173)	50 (47)	52 (47)	14 (14)	509 (484)

• Patents – Total (International)

	K		KI	ITC	К		KI	NC	KI	HST	К	IAI	C	.0 ₂	То	otal
	Pending	Registration	Pending	Registration												
2008		4	24 (3)	-	5	-	6	7	6 (4)	-	-	-	-	-	46 (7)	11
2009	-	-	5	1	-	-	4	-	13 (5)	3 (3)	-	-	-	-	22 (5)	4 (3)
2010	24	3	3	-	-	-	5 (1)	1	15	2 (1)	-	-	-	-	47 (1)	6 (1)
2011	1	-	5	-	-	-	1	-	6	-	-	-	-	-	13	-
2012	-	-	2	-	13	14	7	-	11 (1)	6	-	-	-	-	33 (1)	20
2013	1	-	7	-	20	5 (1)	26	12 (1)	28 (6)	3 (2)	-	-	-	-	82 (6)	20 (4)
2014	3	5	9	-	6	24	10 (3)	4	31 (10)	3	-	-	-	-	59 (13)	36
2015	10	-	8 (1)	-	10 (2)	-	18 (2)	2 (2)	33 (5)	2 (2)	-	-	-	-	79 (10)	4 (4)
2016	-	-	9 (4)	1	3	-	8 (1)	-	2	2	-	-	4 (1)	-	26 (6)	1
2017	7 (2)	9 (6)	75 (19)	69 (12)	6	2	23 (3)	9 (2)	19 (6)	4	3	-	3 (1)	1	136 (31)	94 (20)
2018	13 (1)	11 (7)	52 (15)	57 (14)	12	7	56 (8)	26 (2)	21 (13)	6	45 (9)	18 (5)	3 (1)	1	202 (47)	126 (28)

• Funding & Project (Unit: KRW Million)

	К		KII				KII	NC	KI	IST	KI	AI	C	0 ₂	То	tal
	Fund	Projects	Fund	Projects	Fund		Fund	Projects	Fund	Projects	Fund	Projects	Fund	Projects	Fund	Projects
2008	4,012	24	11,787	54	1,380	13	5,479	32	250	1	-	-	-	-	22,908	124
2009	11,851	49	12,016	63	786	9	17,349	39	782	8	-	-	-	-	42,784	168
2010	9,297	44	9,704	46	990	12	6,127	38	1,074	7	-	-	-	-	27,192	147
2011	8,205	41	11,469	71	1,956	16	7,116	46	3,856	23	-	-	-	-	32,602	197
2012	14,641	75	13,980	76	2,135	17	9,453	62	5,019	21	-	-	-	-	45,228	251
2013	10,715	51	9,947	54	1,695	17	9,952	67	4,813	20	-	-	670	4	37,792	213
2014	7,955	43	7,907	50	3,057	20	9,877	67	4,776	18	-	-	4,173	16	37,745	214
2015	7,633	44	12,130	60	4,104	21	10,238	74	5,329	30	-	-	2,127	14	41,561	243
2016	8,209	32	6,279	46	9,452	58	4,753	21	6,882	25	-	-	3,030	23	38,605	201
2017	6,242	24	11,085	64	5,870	35	7,942	48	6,005	31	1,135	2	1,983	17	40,262	221
2018	11,578	44	10,328	64	17,122	46	12,254	101	4,538	24	12,892	65	2,267	18	70,979	362

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Research Highlights

Sangyong Jon

KI for the BioCentury Professor, Dept. of Biological Sciences

> **Development of** peptide-based remedy to treat psoriasis and atopic dermatitis

Psoriasis, a chronic inflammatory skin disease, is an autoimmune disease that about 3% of adults in the world suffer from. Recently, it was found that a protein called STAT3 is the key cause of psoriasis. A few years ago, the research team was the first to find a peptide that degraded the function of a protein called STAT3 and developed it as an anticancer drug, but it had the disadvantage of thick keratin layers, causing a technical limit for targeted drug treatment. The present study was significant because it succeeded in curing psoriasis in an animal model and built a system that allowed efficient delivery in the skin by producing peptides as nanoparticles and delivering them through the skin.

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66 Peptide-based ointment-type remedy developed for the first time **99**

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Atopy and psoriasis are chronic inflammatory skin diseases, and there are still no drugs that can completely cure them. Therefore, drugs should be used continuously to alleviate the symptoms. Existing steroid series drugs have adverse effects such as a decrease in immunity or edema, but the peptide drug developed by the research team has the advantage of having no adverse effects. "The peptide drug developed by this study has few adverse effects, and it is an ointment applied to the skin. Therefore, the clinical trial can be conducted in a short period of time," said Professor Sangyong Jon. He also said that he expected the development to be continued by technology transfer to a relevant pharmaceutical company in the future. In the meantime, STAT3 protein also plays a key role in idiopathic pulmonary fibrosis, liver fibrosis and renal fibrosis, as well as in cancer, psoriasis and atopy. Therefore, the STAT3 inhibitory peptide drug that is the result of the present study is expected to broaden the treatment of various diseases. The present study was funded by the Global Research Lab Program and the Bio & Medical Technology Development Program of the National Research Foundation of Korea.



The potential of a STAT3-inhibiting peptide for use in the inflammatory skin diseases

Atopy and psoriasis are types of autoimmune diseases. When inflammation occurs due to allergy or infection, immune cells in the body are activated. Afterwards, the symptoms worsen as the activated immune cells cause hyperplasia of skin cells around the inflamed area. The present study came from the fact that the STAT3 inhibitory peptide that had already been developed can prevent the inflammatory response by bonding to STAT3 existing in immune cells and keratinocytes and inhibiting its activation. A peptide is a hydrophilic material, so it cannot penetrate the skin and have a medicinal effect. To solve this problem, 30-40 nm discshaped nanoparticles were created by adequately mixing two types of phospholipid and STAT3 inhibitory peptides for formulation, and the generated disc-type nanoparticle complex was able to penetrate the keratin layer of the skin and effectively reach the dermal layer. They could have an anti-inflammatory effect by entering immune cells and inhibiting the function of STAT3 protein.

Applications of the STAT3-inhibiting peptide to treatments of other detrimental diseases



A schematic illustration for the preparation of discoidal lipid nanoparticles between STAT3-inhibiting peptide (APTSTAT3) and phospholipids and how the nanoparticles are used to treat psoriasis/atopy by transdermal delivery.

Jin-Hee Han

KI for the BioCentury	
Associate Professor,	
Dept. of Biological Sciences	



•• Pay attention to the hidden side of the fear reaction **

The research team of Professor Jin-Hee Han investigated the anterior cingulate cortex (ACC) circuit that controlled the behavioral reactions towards fear, which were determined congenitally, in the research on innate fear response of mice to the smell of a predator. The team found that the ACC neural circuit that projects into the basolateral nucleus of the amygdala (BLA), which was well-known as an important brain structure in the output of fear responses, had a function of inhibiting fear reactions to the smell of a predator. The present study is very meaningful academically because it found the key neural circuit in the brain that coded the congenital fear behavioral reactions to a threatening stimulus. It is expected to be used to develop treatments for anxiety- and fear-related brain diseases such as panic disorder and post-traumatic stress disorder, targeting the anterior cinqulate cortex neural circuit. This was joint research with Dr. Hyeong-Ju Park in the Korea Brain Research Institute funded by the Ministry of Science and ICT.



Investigation of a prefrontalamygdala neural circuit that determines innate fear response

Becoming frozen stiff with fear when someone pops up out of nowhere while walking on the street is something everyone has experienced at one time or another. When confronted with a predator or a dangerous object, a fear reaction can play a role in increasing the likelihood of surviving a threat. In other words, normal fear and anxiety reactions are essential functions for the survival of humans and animals. However, the present study paid the attention to the hidden side of the neural circuit that controls the fear response, and found the circuit that caused a congenital behavioral response to fear and discovered its principle.

A fear reaction that varies according to the stimulus

The behavioral response to fearful stimulus varies depending on whether the person is congenitally sensitive to fear, is frightened easily or not frightened easily, or the person's internal state. The fear response to the same stimulus is different for everyone. In other words, the fear response is not consistent, even though the degree of stimulus is the same. The present study is even more necessary in a society where social anxiety and fear are increasing. The research team began experiments with innate fear response rather than learned fear, and this new way of thinking brought out results with remarkable data. In research with mice using optogeneticsbased nerve cell and neural circuit control technology, the team found a prefrontal-amygdala neural circuit that determined innate fear reactions to the threatening sensory stimulus of the smell of a predator.

Expected effects of the development of treatments for brain diseases



ACC and its projection input to the basolateral amygdala (BLA) contribute to the inhibitory regulation of innate fear response to predator odor in mice

Research Highlights

KI for IT Convergence Research Associate Professor

Multi-device content synchronized play technology

Media synchronization technique is essential for large-scale digital signage that consists of multiple devices, as human's eye feels it awkward even by a difference of 10 msec between screens. So these system utilize expensive hardware that ensures accurate synchronization between screens. Dr. Jung's team has developed a low-cost screen synchronization technique that could work with WiFi communication. Thanks to characteristic of wireless communication, this technique requires low installation cost and has advantages of free-form arrangement. As a result, this technique is expected to play a important role in expending digital signage business Eco-system.



66 Establishment of a large-format digital signage environment

Dr. Jung's media synchronization technique is expected to be attractive in the outdoor advertisement market, as it requires lower budget than existing solutions and could supports a variety of screen arrangement that could strengthen the expressiveness of advertisement. The team has transferred the initial achievement to several companies, and is in the process of developing technique that is suitable for large retail market and media art market under the support of Institute for Information & communications Technology Promotion (IITP) and Ministry of Science and ICT (MSIT). Another mission of this project is to support synchronization of real-time media sources such as theaters, so the team is also in the process of developing real-time media synchronization technique under the support of Institute for Commercialization Promotion Agency for R&D Outcomes. Future plans of this project include organization of technology portfolio and promotion of technology-based commercialization





Low-cost Digital Signage Synchronization Technique

Existing large-scale digital signage solutions require expensive hardware that ensure accurate synchronization between screens. As these hardware require wired environment, it only support limited screen arrangement and inter-screen distance. To overcome these limitations, Dr. Jung's team has developed low-cost wireless screen synchronization technology based on WiFi protocol. Screen synchronization through a wireless communication has several advantages such as free-form screen arrangement and low installation cost, but it is challenging to guarantee accurate synchronization as in a wired environment. To handle this issue, the team's research has focused on minimizing visual gap between screen within 10 msec and controlling real-time media stream. As a result of this project, the team constructed a test-bed that can test various configuration of screen arrangement, and successfully developed core synchronization technique, such as virtual screen group management technique, screen synchronization technique for wireless environment, and media delay correction technique. Based on these results, the team has demonstrated the large-scale digital signage solution that plays 8K high-resolution media streams through Smart China Expo 2018 and Korea Electronic Show 2018.

Promotion of digital signage Eco-system

Research Highlights

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Ho Jong Chang

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KI for IT Convergence Research Assistant Professor



⁶⁶ Development of a measurement technology that diagnoses diseases by itself using a semiconductor device ⁹⁹



Development of the technology to measure aptamer in urine using SiPM

Urinalysis is one of the various methods for disease diagnosis to allow identifying arrhythmia, liver disease, hypertension, etc. by the quantity of potassium in urine. However, the current urine collection and control methods have disadvantages such as the risk of contamination, slow test period and high costs. Therefore, Professor Ho Jong Chang and his research team developed a technology to measure sodium and potassium in urine using a personal diagnostic device by replacing the photomultiplier tube (PMT), the existing tube form, with a silicon photomultiplier (SiPM), a semiconductor device.

Won the ISIITA Best Paper Presentation Award

This research is about developing a system that measures and analyzes the amount of luminescence in real time by reacting the concentration of sodium and potassium in urine with a reagent called an aptamer. A silicon photomultiplier that can measure up to a single photon because it can amplify low light one million times by the internal amplification of a device was used for the early diagnosis of diseases. In order to develop a system for measuring and analyzing this in real time, key technologies of a driver circuit and a signal analysis circuit were developed with researcher Byeong Hun Han and others. This research could be the foundation of a preliminary medical examination system. In the meantime, this research won the best paper presentation award at ISIITA 2018, an international networking symposium where leading researchers in the high-tech information technology application field gather and exchange information on technology convergence. (Paper title: A Study on the Measurement of Aptamer in Urine Using SiPM)

Technology that allows everyone to check their health easily

The present study may play a key role in the fast self-diagnosis of hypotension and hyperlipidemia and prevent diseases such as liver cirrhosis and renal disease. Therefore, it is expected to be widely used where commercialization is required and where there is a demand. This project was able to use SiPM thanks to a grant from the national radiation project and precedent national projects. The research team is now performing tests and processing certification before commercialization of the technology with Sungsan Eng. Co., Ltd., the joint research organization. Professor Ho Jong Chang said, "When the 'point of care test' system in which a quick diagnosis is possible without additional processes such as centrifugation is completed, early diagnosis of a disease and real-time checking of infection will be possible, therefore helping everyone to check their health easily by themselves." In addition, efforts will be made to universalize key technologies as appropriate technologies that improve the quality of life. The present study was conducted with support from the Nano Materials Original Technology Development Project (Advanced Process / Platform Technology R&D Project) of the Ministry of Science and ICT.



A device for measurement of sodium and potassium in urine using a silicon photomultiplier (SiMP)

Dong Soo Kwon

KI for Robotics Professor, Dept. of Mechanical Engineering

Research to develop a microsurgery robot system

There is an extensive range of medical devices and equipment, including medical robots and surgical devices as well as simple consumables. They are becoming increasingly complex and diverse with advances in technology. An examination of trends in the medical devices market indicates that the United States makes up 43.5% of the world market, while Korea accounts for 1.6%. This is a small figure relative to the future growth of the world medical devices market, and commercialization will require the overcoming of institutional barriers and new endeavors. The microsurgery robot developed in the present study challenges existing limitations and is expected to pioneer new possibilities for the medical devices market.



66 Development of a robot system for minimally invasive surgery **99**

Professor Dong Soo Kwon has been studying medical surgical robots for the past 23 years. He considered whether recent research findings should be simply presented in student theses and patented, or commercialized in order to contribute and give back to society. He and eight of his students decided to start a business to commercialize medical surgical robots. He asked himself which of his many research items from over the years would be most helpful to doctors and patients, and concluded that the answer is microsurgery robots. His research commenced based on the results of a survey suggesting that surgeons find retinal surgery difficult. He has developed a microsurgery robot that offers greater precision than human hands can achieve, and it has now reached the commercialization stage.

Limitations and value of microsurgery

Microsurgery is the most difficult form of surgery currently in existence. The outcomes can vary substantially depending on the hand skills and proficiency of the operating surgeon. The future key to success in surgery is the degree to which patients' wounds are minimized. This is because minimization of wounds speeds up patient recovery and minimizes sequelae. Although medical devices have advanced, laparotomy and incisions are still widespread and patient recovery is slow. There is a need to develop invasive surgical procedures that minimize these weaknesses, and to engage in ongoing research to develop extremely small robotic surgical tools.

Development and commercialization of medical surgical robots

A microrobot system to overcome technological limitations

The development of a future-oriented microsurgery robot system through this study to enable shared platforms in the field of microsurgery is expected to spearhead the international microsurgery robot market and achieve at least 500 million dollars in sales in the world market in 2022. The findings of the study have already been recognized internationally. The study was published in the International Journal of Medical Robotics and Computer Assisted Surgery and received the Best Application Award and the Overall Winner at the Surgical Robot Challenge 2018. The study was funded by the Ministry of Trade, Industry and Energy and an in-house KI research program. It also received assistance from Sometech, a 3D microscope manufacturer and joint implementer of national projects. Future studies will involve ongoing research and development efforts to overcome previous technological limitations with the aim of developing invasive surgical procedures and microrobotic surgical tools. The outcomes are expected to be commercialized for such applications as eye surgery, microvascular surgery/neurorrhaphy, cosmetic surgery, and skin grafts.



Hyun Myung

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KI for Robotics Professor, School of Electrical Engineering



Research on intelligent wall-climbing aerial robot platform

How are the world's tallest skyscrapers managed? It makes us wonder. Skyscrapers are dangerous. The wind is more severe at higher levels, increasing the risk of falling. If a robot cleans the glass on skyscrapers, building management will be much easier. The present study started with an idea to use a drone robot system, and an aerial robot has been developed that can diagnose the safety of a building as well as clean it. It is considered to be key research in robot intelligence diversification.

66 An innovative encounter between a drone and a robot **99**

In relation to the research on driving and attachment and detachment to and from the walls of a drone-based robot platform, the current location and pose of the robot platform can be estimated by various sensors such as a stereo camera, a marker camera and a 2D LiDAR. In addition, the research team is making efforts to develop an algorithm that enables a stable approach to the target area and the wall and location maintaining control, and an algorithm that enables a stable approach to the wall by measuring the distance to it via sensors such as a stereo camera or ultrasound and automatic clinging to the wall using sensor information. "As moving on various walls and safe takeoff and landing to and from the wall become possible, a tilt-rotor structured robot platform and rotor angle and thrust control algorithm will be integrated to make a platform that can be used for both perching and climbing on the wall" Professor Myung said. He added that this will allow the platform to be controlled by recognition of the different slopes and shapes of the walls, and explained the possibility of the research. The results of the research are likely to be used for safety monitoring purpose using a drone and for the wall cleaning and structure monitoring markets. Professor Myung expressed his gratitude to the researchers who were devoted to the research, which had many trials and errors. He is planning to increase the commercial and technical value of this research technology so that it can be commercialized through technology transfer.

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Improvement on existing tilt rotor method using the EDF

The present study has been conducted since 2013. The research team has made an effort to miniaturize the robot and create intelligent robots. The weight lightening and miniaturization of robot platforms were necessary to respond to various situations such as narrow indoor and outdoor structures that large robots cannot access, as well as various facilities such as the surface of an aircraft, the rotor of a wind power generator and the outer walls of a building. The movement is not controlled by a person, but by a robot that detects the distance by itself and clings to the glass surface. The tilt rotor method using the existing electric ducted fan (EDF) was improved to create a stable wall-climbing robot platform combining an ordinary propeller and the tilt method. A small airframe that can perform perching, moving and detaching mechanisms was developed. In addition, the research team designed a lightweight suspension platform structure with contact surface composite materials and shapes to maximize the maintenance of the grip force while maintaining the miniaturization of the robot. It is expected to respond to various urban environments as an intelligent robot platform for movement.

Infinite possibilities of a wall-climbing aerial robot



[Fig. 1] Robot position control for stable wall perching





[Fig. 2] Sensor-based indoor and outdoor autonomous navigation



 \textcircled Wall climbing experiment on a -15° slope \textcircled Wall climbing experiment on a $+15^\circ$ slope \textcircled Obstacle conquest experiment

[Fig. 3] Wall climbing experiment in various wall environments

Hye Ryung Byon

KI for the NanoCentury Associate Professor, Dept. of Chemistry

Development of technology to improve the reversibility of the discharge-charge process for lithium-oxygen batteries

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Despite its high energy density that can determine the driving range of battery-powered automobiles and drones, a lithium-oxygen battery has the disadvantage of a slow and irreversible charging process. One of the critical reasons for this is the insulating characteristic of lithium peroxide (Li_2O_2), which is formed through the electrochemical reaction between oxygen gas and lithium ion during discharge. The shape and structure controls allow Li_2O_2 to enhance ionic and electronic conductivity and also to decompose facilely during the charging process, for which studies have been conducted by the KAIST research team.



66 Development of a lithium-oxygen battery based on an understanding ?? of the electrochemical interface reaction

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Research focusing on development of a new battery

For the discharging and charging process, Li_2O_2 is formed and decomposes, respectively, in the positive electrode of a lithium-oxygen battery. Typically, the electron and Li^+ ion move very slowly in the bulk Li_2O_2 , and the resulting sluggish decomposition during the charging process also exacerbates severe side reactions in the battery. The research team of Professor Hye Ryung Byon developed a way to design one-dimensional nanostructured, thin and non-crystalline Li_2O_2 that exhibited a superior decomposition rate. The shape of Li_2O_2 was controlled from a mesoporous carbon electrode, and the Li_2O_2 was formed from the confined mesopore during the discharging process.

Key technology to improve reversibility and charging speed

The control of the shape and structure of Li_2O_2 is the key technology to improve the reversibility and charging speed of a lithium-oxygen battery. The research team of Professor Byon demonstrated facile decomposition appearing from the low volume and high surface area of Li_2O_2 by using electrochemical atomic force microscopy. Based on this knowledge, the research team developed a thin and one-dimensional nanostructure of Li_2O_2 as the lithium-oxygen electrochemical reaction was induced in the framework of a mesoporous carbon electrode. The one-dimensional shape of Li_2O_2 mimics the hexagonal channel of mesopores in the carbon electrode. In addition, the non-crystalline structure of Li_2O_2 also contributed to increasing ionic and electronic conductivity. The resulting Li_2O_2 decomposed even with an increasing charging rate over 2000 mA/g in contrast with large overpotential appearing in typical bulk Li_2O_2 caused by its sluggish decomposition.

The present study for the design of Li_2O_2 shape and structure showed the possibility of improving the performance of a lithium-oxygen battery. The knowledge to surmount the low conductivity of a discharging product has a broad application for next-generation batteries in particular and can be applied to a lithium-sulfur battery that also includes a similar challenge of insulating sulfur. This work can also contribute to commercializing lithium-oxygen battery technology in the future by providing key insights into lithium-oxygen electrochemistry.





[Fig. 2] Comparison of (a) discharging-charging potential profile and (b) round-trip efficiency. The mesoporous CMK-3 electrode (red) shows the lowest charging potential and the highest round-trip efficiency among various carbon electrodes (LPC: large pore carbon, CNT: carbon nanotube. KB: Ketien Black nanoparticle) and with various catalysts (TEMPO redox mediator. Ru, and CO.O.)

[Fig. 3] Comparison of charging potentials with increasing charging rates (arrows) for (a) CMK-3 forming one-dimensional Li_2O_2 and (b) CNT forming bulk Li_2O_2

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Min-Ho	Seo	

Jun-Bo Yoon

KI for the NanoCenturyKI for the NanoCenturyPh. D.,Professor,School of Electrical EngineeringSchool of Electrical Engineering



Development of mechanical nanowire transfer technology for wafer areas and flexible electronics applications

Nanowire, a typical nano-material, is an extremely thin wire with a diameter of with hundreds of nanometer. Nanowire production technology is considered to be one of the 10 new technologies that will change the world. However, conventional methods for producing nanowire electronics have problems with property homogeneity, resulting in property variations even when produced using the same method. The present study was conducted to fabricate flexible electronics using nanowire in a uniform and reliable manner.

66 Development of a new nano-transfer technology **99**

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Development of a new nano-transfer technology

Nanowire is believed to be suitable for small, flexible electronics essential in the era of the Fourth Industrial Revolution due to its small, lightweight structure and excellent physical and chemical properties. The research team of Dr. Min-Ho Seo and Prof. Jun-Bo Yoon developed a new nano-transfer technology to resolve the non-homogeneity issue of conventional methods, where chemically synthesized nanowires are mixed with a solution and randomly sprayed on a flexible substrate. This new technology makes use of differences in mechanical adhesion, has low material dependence, and is based on standard physical vapor deposition. Remarkably, the team was able to fabricate metal oxides crystallized with various metallic nanowires such as gold, platinum, and copper, fully aligned on a flexible substrate.

The promising future value of nanoelectronic technology

Nano-transfer technology refers to a technology used to transfer nanowires from a certain surface or substrate to another surface. The technology can be used to produce nanowires on a firm but physically and chemically stabilized substrate (mold) and then transfer them to a flexible substrate using chemical adhesion. Previous methods were only able to produce certain nanowire materials whose adhesion can be chemically controlled. In contrast, the technology developed in the present study not only produces nanowires based on standard physical vapor deposition but also uses mechanical adhesion, which has low material dependence, enabling the fabrication of nanowires on a flexible substrate using a wide range of materials. This technology offers a reliable platform for producing nanowires on a flexible substrate with a variety of materials. It is very valuable because it will facilitate the stable development of high-performance flexible electronics that are becoming essential to industries.

The present study demonstrated that nanowires can be produced from various materials on a flexible substrate. It presents evidence that it is possible to achieve stable devices that can be applied to flexible heater and gas sensor devices and used in real-life situations. The research team plans to use the technology to develop displays, sensors, and other electronics that play a key part in everyday life. The present study was funded by the Mid-career Researcher Program of the National Research Foundation of Korea, and the Open Innovation Program of the National NanoFab Center.



[Fig. 1] Overall (a) and detailed (b) schematic diagram of the nano-transfer technology developed

- [Fig. 2] Optical surface (a,c,d,e) and electron microscope cross-section (b) results of nanowire transfers using various materials
- [Fig. 3] Gas sensor application (a) and results (b) using the technology developed

Research Highlights

Yong Jeong

KI for Health Science and Technology Associate Professor, Dept. of Bio and Brain Engineering

Neural substrates of cognitive reserve in Alzheimer's disease spectrum and normal aging

Medicine to treat Alzheimer's disease is extremely difficult to develop, and global pharmaceutical companies have invested trillions of won in development to no avail. This is the reason why dementia medicine is currently only able to provide temporary relief from symptoms. The Korean government has recognized the alarming seriousness of dementia and aims to address it as a national agenda. The present study demonstrates that cognitive reserve varies among patients, and suggests that controlling of this difference in clinical drug trials and an individualized approach is required.



•• Proposing a personalized treatment approach ******

Potential targets for the treatment and prevention of Alzheimer's disease Professor Yong Jeong suggests that different methods should be used to approach the disease in different people because cognitive ability is affected by both genetic differences and environmental factors, and that "it is necessary to boost brain endurance (cognitive reserve)." Examinations of the brains of people with dementia show that some had serious pathological findings but minor dementia symptoms, while others had severe symptoms but few pathological findings in the brain autopsy. This difference is due to cognitive reserve, which should be increased. The present study developed a model to quantify cognitive reserve, incorporating all major causes of Alzheimer's disease. In the future, the model will help to distinguish between people who are vulnerable to Alzheimer's disease and those who are resistant. It will also help to predict the clinical prognosis of patients, or classify patients for clinical studies. Moreover, it suggests that the middle temporal pole may be a potential target in the treatment of Alzheimer's disease or preventive treatment.

Development of a model to quantify cognitive reserve

Cognitive reserve is a concept that refers to the discrepancy between the severity of a patient's neuropathological findings and actual clinical symptoms. It is an important protective factor that controls the influence of neuropathology on cognitive function in patients with dementia. However, few methods have been developed to quantify the concept, and it is usually measured indirectly using education, activity, and other approximations. The present study used the latest multimodal neuroimaging techniques such as MRI and PET to create a cognitive reserve model that incorporates amyloid, tau, and neurodegeneration, the main causes of Alzheimer's disease. The model was indirectly validated using an existing model, and also examined to see whether it directly changes the relationship between neuropathology and cognitive function.



Modeling process of cognitive reserve quantification and Network and Connectivity Neural correlates of Cognitive reserve

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Yoonkey Nam	Ji-Ho Park
KI for Health Science and	KI for Health Science and
Technology	Technology
Associate Professor,	Associate Professor,
Dept. of Bio and Brain Engineering	Dept. of Bio and Brain Engineering



Development of a photothermal neurostimulation platform technology using gold nanoparticles

Neurons are activated as they exchange information, and this is an important part of the understanding of brain function. In order to overcome the limitations of previously developed technologies in neural engineering, the research team of Professor Yoonkey Nam, a neural interface researcher, and Professor Ji-Ho Park, a bionanomaterials researcher, chose to use gold nanorods. Their photothermal stimulation chip platform, which can control neuron activity, is expected to be applicable not only to hippocampal neurons, but to all neurons in general.

New Era of Brain Research

Recent advances in neuromodulation technologies enable the control of neural activity (action potential) at he single cell level using light-sensitive cell membrane ion channels or pumps. However, one major obstacle o the use of this optogenetic technology in clinical treatment is difficulties in genetic modification. In order o control the electrical activity of neurons with light without genetic modification, the research team of professors Nam and Park used gold nanoparticles, which interact with light to generate localized heat. Using a method of cell activity control whereby gold nanoparticles attached to the surface of neurons absorb nearinfrared light to generate localized heat around the cell membranes, they analyzed the impact of photothermal effects on neurons at the single-cell level and demonstrated that the results can be used to analyze networks.

⁶⁶ Proposing a new way of analyzing neural circuits using light and heat ⁹⁹

Using the plasmonic photothermal effect to control single-cell electrical activity and analyze networks

The study found that when plasmonically induced photothermal stimulation of gold nanoparticles is applied to single neurons, a low-level laser can be used to clearly inhibit the electrical activity of neurons in a localized manner. The plasmonic photothermal effect was able to quickly and very reliably inhibit the electrical activity of single neurons without damaging them. These findings are expected to be a useful tool for analyzing brain function by inducing changes in neural circuit patterns and potentially examining the modulation and functional connectivity of in vivo circuits. This study was funded by the Mid-Career Researcher Program of the National Research Foundation of Korea.



Technique to analyze neural circuits using plasmonic nanoparticles (Source: ACS Nano 2019, 13(1))

Research Highlights

Sang Wan Lee

Assistant Professor,

KI for Artificial Intelligence

Dept. of Bio and Brain Engineering

Research on control algorithms that can learn like a human

Research on reinforcement learning has been conducted in the engineering field as well as studied continuously for the past 20 years in decision making and the computational neuroscience field. Since the first research results were published in the late 1990s showing that the data processing procedure in the midbrain's dopamine system involved in human and animal behaviors and the learning process could be explained by reinforcement learning theory, there have been many developments in reinforcement learning in the field of neuroscience.



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The research team of Professor Sang Wan Lee is conducting artificial intelligence-neuroscience convergence research to understand the learning control mechanism of the prefrontal cortex and apply it to the design of an artificial intelligence system. This research has sometimes led to the development of various types of algorithms, but furthermore, it is meaningful because neuroscience-based reinforcement learning theory presents the possibility of solving various difficult engineering problems such as a design that balances performance, efficiency and speed. The present study proposed a "prefrontal meta-controller" theory based on the fact that human brains easily solve engineering problems that individual algorithms such as reinforcement learning cannot solve. The point of this theory is that the reward prediction signal or state prediction signal that can assess the reliability of learning about the external environment by itself is processed in the basal ganglia-ventrolateral prefrontal cortex network, and the human brain finds the learning and inference strategy most suitable to the changing external environment through a dynamic process that competitively and cooperatively integrates the information.

Studies on its applicability to the robotics and neuroscience fields based on brain-inspired artificial intelligence technology were published in two papers, one in Science Robotics and the other in Current Opinion in Behavioral Sciences.

66 Discussing brain-inspired artificial intelligence technology ??

Publication of a paper unprecedented domestically and internationally The approach in the present study is novel because unlike the paradigm of existing AI research that replaces a human's work using AI technology, it combines the high-level learning and inference processes of humans with an AI algorithm to improve the learning and inference control ability of humans. If advanced functions of the human brain can be reflected in the design of an artificial intelligence system, its performance can be significantly improved, and on the other hand, if the quasi-optimal mechanism of humans is reflected in the design of an artificial intelligence system, a customized service based on a deeper understanding of humans can be provided. It is expected that the human and AI systems can interact at a deeper level in the near future. Continuity of research using brain-inspired artificial intelligence technology In the future, research will be continued including studies to design an artificial intelligence system based on a more fundamental principle or theory of brain function, beyond artificial intelligence research that transplants some computational modules of the brain into an algorithm, and research to verify complex brain science

hypotheses that cannot be solved by conventional approaches of brain science by virtue of the latest artificial intelligence techniques. Professor Lee thanked the many people who gave him an opportunity, even though the research was a huge challenge, and explained that he would publish various research results based on the theory. In 2014, Professor Lee presented neuroscientific evidence for the first time in the academic world that the prefrontal-basal ganglia brain network circuit in humans can control heterogeneous reinforcement learning strategies, and in 2015 presented research that the same brain circuit controls the one-shot inference process through interaction with the hippocampus.

Young-Ho Cho

KI for Artificial Intelligence Professor. Dept. of Bio and Brain Engineering

•• Proposing a new predictor of human comfort **

Value and effects of human thermal comfort measured through skin hardness The thermal comfort experienced by humans can be determined based on variations in skin temperature and skin conductance. While previous methods examined only skin temperature and conductivity, Professor Cho and his research team observed skin elasticity based on the hardening of skin in colder temperatures and identified a new index that increases the accuracy and reliability of thermal comfort judgments. They attracted the attention of renowned overseas journals and media as they were the first in the world to consider the hardness of skin as an indicator of human thermal comfort. First, the research team conducted a study on 30 participants to establish that skin hardness is independent of existing indicators. The results found that the variance inflation factor of skin hardness, skin temperature, and skin conductance was in the range of 1.68~2.04, which suggests that skin hardness is independent (variance

inflation factor of 5 or less) of skin temperature and skin conductance. The coefficient of determination for skin hardness (0.6302) was similar to that for skin temperature (0.5414) and perspiration rate (0.6176), providing experimental evidence that skin hardness is an effective indicator for judging human thermal comfort. The present study added skin hardness to existing thermal comfort indicators (skin temperature, skin conductance), thereby increasing the coefficient of determination by 17.6% and reliability of judgment by 23.5% to produce a more reliable human thermal comfort model. The findings are expected to have a major impact on new industry/business creation as they can be applied to such devices as personalized smart air conditioners by learning individual models. Based on these research findings, Professor Cho is developing a technology to determine the prognosis or status of cancer by using physiological signs apparent on the surface of cancer cells. "A technology is important not in its own right, but according to the purpose it will be used for," he emphasized, adding that he will strive to demonstrate the effectiveness of new artificial intelligence in biological or medical fields to evaluate the mental or physical status of humans using physiological signs as indicators.

Thermal comfort is judged based on two indicators: skin temperature and skin conductance. However, a model for determining human thermal comfort using two indicators is problematic in that it has a low coefficient of determination and low reliability of judgment. This created a need to discover a new indicator of human thermal comfort, capable to resolve the issue.



World's first discovery of a new indicator of human thermal status

World's first discovery of a human comfort indicator

People are becoming increasingly interested in health. The abundance of health-related information allows us to look after our physical health, but the importance of mental health is often unrecognized. Different people experience different emotions, and a person experiences different emotions depending on the time of day and situation. However, the focus is usually on analyzing air temperature, humidity, and other aspects of the surrounding environment without examining the signs of emotions apparent in people. Professor Young-Ho Cho and his research team are aware of the importance of mental health and have focused on the methods to measure mental health for a decade. In particular, they have concentrated their efforts on developing a simple and accurate method to identify human emotions such as comfort, impression, and stress. Later they became the first researchers in the world to discover new physiological skin signs, including skin elasticity and goose bumps, capable to identify and judge human emotions.





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Research Highlights

Hyunjoo Lee

KAIST Saudi Aramco-KAIST CO₂ Management Center Professor, Dept. of Chemical and Biomolecular Engineering

An energy-efficient CO, conversion catalyst technology using both light and heat

The issue of climate change caused by global warming is much more serious than many imagine. The world is already experiencing difficulties with natural disasters, localized downpours, drought, torrential rain, and heavy snow. This has sparked much research on solutions to reduce carbon dioxide (CO_2) . Carbon dioxide is the main cause of global warming and climate change, and there is an urgent need to develop efficient technologies to address the issue.



⁶⁶ Investigating a catalyst technology that can directly convert CO₂ ⁹⁹ into high value-added compounds

The research team published a study in which it found that when an Ru catalyst was used, CO₂ was strongly bound to the Ru surface and the bound complex absorbed light to enable easy breakdown of CO₂ and conversion into CH_a. Ru is believed to be generally unaffected by light. However, the study found that the Ru-CO₂ complex can absorb light, and in such cases, CO₂ can be broken down easily at much lower temperatures than when there is no light. These findings are expected to significantly contribute to the easy and low-energy production of CH₄. In the future it may also be very useful for in-situ fuel production, whereby the hydrogen produced from the use of wind/photovoltaic power and waste carbon dioxide is used to synthesize methane and other fuels where and when necessary.

Technology research to obtain a high-performing catalyst

Professor Hyunjoo Lee and her research team were studying plasmonic catalysts when they noticed that light irradiation substantially decreased the reaction temperature. At the time, they were testing the ethanol dehydrogenation reaction. They concluded that if the same phenomenon was achieved with the CO_2 conversion reaction, they could dramatically reduce the total energy cost involved in converting CO₂ into more useful compounds. Many research teams are investigating methods to isolate, collect, and store CO₂ from the air, but there has been little success in finding a clear method for stable storage of the vast amounts of CO₂ collected. This created a need to convert CO₂ into more valuable compounds using chemical methods, and the strategy was to form a cycle that converts those compounds back into CO2. The process of converting CO2 into compounds requires a catalyst. In other words, it was necessary to engage in technology research to obtain a high-performing catalyst to convert CO₂, the most thermodynamically stable carbon substance in air, into other compounds.

Efficient energy conversion through catalyst technology

When converting CO₂ that has been collected into high value-added compounds, factors such as the presence of large amounts of impurities in the CO₂ and CO₂ concentration have a major influence on catalyst action. It is possible to produce high-purity CO₂ through various separation processes, but such methods have high separation costs. A catalyst that can directly convert low-purity, low-concentration CO₂ into high value-added compounds would significantly reduce the total cost of the overall CO₂ conversion reaction. The research team plans to continuously develop catalysts to selectively target and convert CO₂ from a mixture of various substances using little energy.



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CO2 Management Center **Development of a nickel-molybdenum**

Saudi Aramco-KAIST

catalyst that is stable to the reaction conditions for dry reforming of methane

The reduction of carbon dioxide emissions in accordance with greenhouse gas emission regulations is one of the most important tasks faced by industries. Carbon dioxide accounts for a large percentage of greenhouse gases, making it necessary to seek direct measures to supply energy efficiently without producing carbon dioxide. Professor Cafer Yavuz and his research team have successfully developed a catalyst that does not cause coking even when used for dry reforming of methane for long periods of time.

Researching carbon dioxide gases to save the environment

Dry reforming of methane (CH₄+CO₂ \rightarrow 2CO+2H₂) has recently attracted great interest as a reaction that can convert carbon dioxide, the main cause of global warming and ocean acidification, into useful substances. Catalysts are essential to the dry reforming of methane and have generally been developed using platinum (Pt), alladium (Pd), rhodium (Rh), and other precious metals. However, there were limitations for actual industry use due to the high price of precious metals. In order to overcome this issue, Professor Yavuz and his research eam studied metals that are active in the dry reforming reaction. Moreover, energy production using fossil uels generates carbon dioxide gases that cause global warming, which adversely affects the environment, and the team aimed to convert these gases into useful products.

Increased production volume and activity by producing a new nanoparticle

Nickel (Ni) has a high likelihood of success as it is highly active and affordable, but its critical weakness is that carbon builds up (coking) as the reaction progresses and the metal is sintered and deactivated. In order to achieve a high yield, the thermodynamic reaction must take place in a high-temperature, high-pressure environment. Under such conditions, however, the catalyst is also modified and loses its activity over time, eventually becoming deactivated. Carbon build-up on the surface results in a decreased production volume and sintering decreases the conversion rate over time by reducing the active surface. To prevent coking and sintering, the research team produced a nanoparticle containing nickel (Ni) and molybdenum (Mo) on top of a single crystalline magnesium oxide (MgO), and found that it does not cause coking even when used for dry reforming of methane for long periods of time. "The present study has increased production volume and activity, and larger volumes of the catalyst can be used for longer periods of time (about 850 hours) compared to previous catalysts. The scientific principle and techniques will be applied to other catalysts based on the current findings," Professor Yavuz said. The present study was funded by the NRF, and commercialization is in progress in collaboration with the Saudi Aramco CO₂ Management Project Team.

Conceptual diagram of dry reforming catalyst design

Research Achievements

KAIST Institute for the BioCentury

• Research Area(Human Microbiome Control)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Systems assessment of transcriptional regulation on central carbon metabolism by Cra and CRP (Nucleic Acids Research, 2018.01)
2	Paper		Genome-scale analysis of Methicillin-resistant Staphylococcus aureus USA300 reveals a tradeoff between pathogenesis and drug resistance (Scientific Reports, 2018.02)
3	Paper		Elucidation of the bacterial communities associated with the harmful microalgae Alexandrium tamarense and Cochlodinium polykrikoides using nanopore sequencing (Scientific Reports, 2018.03)
4	Paper	Cho. Byung-Kwan	High-level dCas9 expression induces abnormal cell morphology in Escherichia coli (ACS Synthetic Biology, 2018.04)
5	Paper	, - ,	Fabrication of Three-Dimensional Porous Carbon Scaffolds with Tunable Pore Sizes for Effective Cell Confinement (Carbon, 2018.04)
6	Paper		Systematic discovery of uncharacterized transcription factors in Escherichia coli K-12 MG1655 (Nucleic Acids Research, 2018.08)
7	Paper		Genome-scale analysis of Acetobacterium bakii reveals the cold adaptation of psychrotolerant acetogens by post-transcriptional regulation (RNA, 2018.09)
8	Paper		Characterizing posttranslational modifications in prokaryotic metabolism using a multiscale workflow (PNAS, 2018.10)
9	Paper		Coating of an antimicrobial peptide on solid substrate via initiated chemical vapor deposition (JOURNAL OF INDUSTRIAL AND ENGINEERING CHEMISTRY, 2018.02)
10	Paper		Repeated batch methanol production from a simulated biogas mixture using immobilized Methylocystis bryophila (ENERGY, 2018.02)
11	Paper		Ginsenoside F1 suppresses astrocytic senescence-associated secretory phenotype (CHEMICO-BIOLOGICAL INTERACTIONS, 2018.03)
12	Paper		Genetic incorporation of L-dihydroxyphenylalanine(DOPA) biosynthesized by a tyrosine phenol-lyase (CHEMICAL COMMUNICATIONS, 2018.03)
13	Paper		High-Level dCas9 Expression Induces Abnormal Cell Morphology in Escherichia coli (ACS SYNTHETIC BIOLOGY, 2018.04)
14	Paper		Fabrication of three-dimensional porous carbon scaffolds with tunable pore sizes for effective cell confinement (CARBON, 2018.04)
15	Paper	Kim, Sun Chang	Systematic dissection of the evolutionarily conserved WetA developmental regulator across a genus of filamentous fungi (MBIO, 2018.07)
16	Paper		Development of Bacillus methanolicus methanol dehydrogenase with improved formaldehyde reduction activity (SCIENTIFIC REPORTS, 2018.08)
17	Paper		Rerouting of NADPH synthetic pathways for increased protopanaxadiol production in Saccharomyces cerevisiae (SCIENTIFIC REPORTS, 2018.10)
18	Paper		Production of bioactive ginsenoside Rg3(S) and compound K using recombinant Lactococcus lactis (JOURNAL OF GINSENG RESEARCH, 2018.10)
19	Paper		Ginsenoside F1 Promotes Cytotoxic Activity of NK Cells via Insulin-Like Growth Factor-1-Dependent Mechanism (FRONTIERS IN IMMUNOLOGY, 2018.11)
20	Paper		Genome-scale analysis of Acetobacterium bakii reveals the cold adaptation of psychrotolerant acetogens by post-transcriptional regulation (RNA, 2018.12)
21	Paper		Insights into Cell-Free Conversion of CO_2 to Chemicals by a Multienzyme Cascade Reaction (ACS CATALYSIS, 2018.12)
22	Paper	Cho, Byung-Kwan, Kim, Sun Chang	Synthesis of cross-linked protein-metal hybrid nanoflowers and its application in repeated batch decolorization of synthetic dyes (JOURNAL OF HAZARDOUS MATERIALS, 2018.04)
23	Patent	Cho Ruung Kwan	A recobinant microorganism having elevated active level of 6-phosphogluconate dehydrogenase or/and the Paulder protein PrsA A recombinant microorganism and its application (Patent application, 10-1018-0007890, 2018.01)
24	Patent	Cho, byung-ƙwall	A compositon for preventing or treating metabolic diseases comprised of protain derived from Akkermansia muciniphila (Patent application, 10-1018-0167577, 2018.12)
25	Patent		Novel UDP-glycosyltransferase derived from ginseng and use thereof (Patent registration, CN104854235B, 2018.01)
26	Patent	Kim, Sun Chang	Amphipathic peptide-lipase conjugate having advanced lipase activity and use thereof (Patent registration, 2742069, 2018.05)
27	Patent		A novel glycosyltransferase derived from Dolwoe and use thereof (Patent registration, 9896710, 2018.07)
28	Patent	Kim, Sun Chang	Amphipathic peptide-lipase conjugate having advanced lipase activity and use thereof (Patent registration, 10-1887732-0000, 2018.08)

• Research Area(Cancer Metastasis Control)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Immune signatures correlate with L1 retrotransposition in gastrointestinal cancers (Genome Research, 2018.08)
2	Paper	Choi, Jung Kyoon	Novel cancer gene variants and gene fusions of triple-negative breast cancers reveal their molecular diversity conserved in the patient-derived xenograft model (Cancer Letters, 2018.08)
3	Paper		Spatiotemporal Control of TGF- β Signaling with Light (ACS Synthetic Biology, 2018.02)
4	Paper		Reciprocal control of excitatory synapse numbers by Wnt and Wnt inhibitor PRR7 secreted on exosomes (Nature Communications, 2018.08)
5	Paper	Heo, Won Do	Synergistic Ensemble of Optogenetic Actuators and Dynamic Indicators in Cell Biology (Molecules and Cells, 2018.09)
6	Paper		Salmonella exploits host Rho GTPase signalling pathways through the phosphatase activity of SopB (Cell Microbiology, 2018.10)
7	Paper		BRAF somatic mutation contributes to intrinsic epileptogenicity in pediatric brain tumors (Nature Medicine, 2018.11)
8	Paper		Biopsy Needle Integrated with Electrical Impedance Sensing Microelectrode Array towards Real-time Needle Guidance and Tissue Discrimination (Scientific Reports, 2018.01)
9	Paper	loong Won II	Inverse agonist of ERR γ reduces cannabinoid receptor type 1-mediated induction of fibrinogen synthesis in mice with a high-fat diet-intoxicated liver (Arch Toxicol., 2018.09)
10	Paper	Jeong, won n	CX3CR1 differentiates F4/80low monocytes into pro-inflammatory F4/80high macrophages in the liver (Scientific Reports, 2018.10)
11	Paper		Experimental Applications of in situ Liver Perfusion Machinery for the Study of Liver Diseases (MOLECULES AND CELLS, 2018.12)
12	Paper		Enhanced Doubly Activated Dual Emission Fluorescent Probes for Selective Imaging of Glutathione or Cysteine in Living Systems (American Chemical Society, Analytical Chemistry, 2018.02)
13	Paper		Enhanced Electron Transfer Mediated by Conjugated Polyelectrolyte and Its Application to Washing-Free DNA Detection (American Chemical Society, Journal of the American Chemical Society, 2018.02)
14	Paper		Bilirubin Nanoparticle-Assisted Delivery of a Small Molecule-Drug Conjugate for Targeted Cancer Therapy (American Chemical Society, Biomacromolecules, 2018.06)
15	Paper		Biotinylated Bilirubin Nanoparticles as a Tumor Microenvironment-responsive Drug Delivery System for Targeted Cancer Therapy (Wiley-VCH Verlag GmbH & Co. KGaA, Advanced Science, 2018.06)
16	Paper	Jon, Sang Yong	Nanoparticle-Assisted Transcutaneous Delivery of a Signal Transducer and Activator of Transcription 3-Inhibiting Peptide Ameliorates Psoriasis-like Skin Inflammation (American Chemical Society, ACS Nano, 2018.07)
17	Paper	. 5 5	ls it worth expending energy to convert biliverdin into bilirubin? (Elsevier Science INC, Free Radical Biology and Medicine, 2018.08)
18	Paper		Curcumin as a Novel Nanocarrier System for Doxorubicin Delivery to MDR Cancer Cells: In Vitro and In Vivo Evaluation (American Chemical Society, ACS Applied Materials & Interfaces, 2018.08)
19	Paper		Magnetic Resonance Imaging-Guided Drug Delivery to Breast Cancer Stem-Like Cells (Wiley-VCH Verlag GmbH & Co. KGaA, Advanced Healthcare Materials, 2018.11)
20	Paper		Antibody-assisted delivery of a peptide-drug conjugate for targeted cancer therapy (American Association for Cancer Research, Molecular Pharmaceutics, 2018.12)
21	Paper		Polymer thin film-induced tumor spheroids acquire cancer stem cell-like properties (American Association for Cancer Research, 2018.12)
22	Paper	Kim, Mi-Young	c-MYC Drives Breast Cancer Metastasis to the Brain, but Promotes Synthetic Lethality with TRAIL (Molecular Cancer Research, 2018.06)
23	Paper	Oh, Byung Ha	Structural study reveals the temperature-dependent conformational flexibility of Tk-PTP, a protein tyrosine phosphatase from Thermococcus kodakaraensis KOD1 (PLOS ONE, 2018.05)
24	Paper	Oh, Byung Ha	Structural basis of inactivation of Ras and Rap1 small GTPases by Ras/Rap1-specific endopeptidase from the sepsis-causing pathogen Vibrio vulnificus (JOURNAL OF BIOLOGICAL CHEMISTRY, 2018.11)
25	Paper	Comp. I' I	Integrative Structural Investigation on the Architecture of Human Importin4_Histone H3/H4_Asf1a Complex and Its Histone H3 Tail Binding (Journal of Molecular Biology, 2018.03)
26	Paper	Song, Ji-Joon	Regulation and function of H3K36 di-methylation by the trithorax-group protein complex AMC (Development, 2018.04)

Research Highlights

Research Achievements

KAIST Institute for the BioCentury

Research Achievements

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• Research Area(Integrated sensors)

KAIST Institute for the BioCentury

	Paper/Patent	Chief Researcher	Representative Research Achievements
27	Paper	Song, Ji-Joon	Novel DNA Aptamers that Bind to Mutant Huntingtin and Modify Its Activity (MOLECULAR THERAPY, 2018.06)
28	Paper		ANKRD9 is associated with tumor suppression as a substrate receptor subunit of ubiquitin ligase (Biochimica Biophysica Acta(BBA) Molecular Basis of Disease, 2018. 10)
29	Patent		Protective Effects of Ginsenoside F2 on Alcohol-Mediated Steatohepatitis (Patent registration, JP 6293099, 2018.02)
30	Patent	Jeong, Won Il	Composition for preventing or treating liver cancer containing ginsenoside F2 (Patent registration, US 9943534, 2018.04)
31	Patent		A composition for preventing or treating liver cancer comprising 4-methylpyrazole (Patent application, 10-2018-0123118, 2018.10)
32	Patent		Method of producing cancer stem cell spheroid (Patent application, 10-2018-0012338, 2018.01)
33	Patent	lan Cana Vana	Lipid Nano Particle Complex Comprising Aptide Fused With Cell Penentrating Materials And Use Same (Patent application, 10-2018-0019778, 2018.02)
34	Patent	Joh, Sang Tong	Engineering of various metal coordinated complexes with pegylated bilirubin and its diverse applications (Patent application, PCT/KR2018/005515, 2018.05)
35	Patent		Method of producing cancer stem cell spheroid (Patent application, PCT/KR2018/013838, 2018.11)
36	Patent	Lee, Jie-Oh	Peptides for forming protein-protein conjugate and the method for forming protein-protein conjugate using the same (Patent application, 10-201800037451, 2018.03)

• Research Area(Brain Cognitive Function Control)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper	Choi, Jung Kyoon	Selection on the regulation of sympathetic nervous activity in humans and chimpanzees (PLOS Genetics, 2018.04)
2	Paper		Serine metabolism in the brain regulates starvation-induced sleep suppression in Drosophila melanogaster (PNAS, 2018.07)
3	Paper	Han, Jin Hee	Anterior cingulate cortex and its input to the basolateral amygdala control innate fear response (Nature Communications, 2018.07)

• Others

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Patenet	Choi, Jung Kyoon	Deep learning-based disease risk variants detection device (Patent application, 10-2018-0065347, 2018.08)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Photodiode area effect on performance of X-ray CMOS active pixel sensors (Journal of Instruments, 2018.02)
2	Paper		Evaluation of eye lens dose to workers in the steam generator at the Korean optimized power reactor 1000 (Radiation Protection Dosimetry, 2018.03)
3	Paper		Monte-Carlo Simulations of Criticality Safety Assessments of Transuranic Element Storage in a Pyroprocess Facility (Nuclear Engineering and Technology, 2018.03)
4	Paper	Cho, Gyuseong	Inverse Calibration Matrix algorithm for Radiation Detection Portal Monitors (Radiation Physics and Chemistry, 2018.08)
5	Paper		Attenuation Curves of Neutrons from 400 to 550 Mev/u for Ca, Kr, Sn, and U ions in Concrete on a Graphite Target for the Design of Shielding for the RAON In-flight Fragment Facility in Korea (Nuclear Engineering and Technology, 2018.09)
6	Paper		Study on Collimator Design for Neutron Science Facility of RAON Accelerator Complex (Nuclear Instruments and Methods in Physics Research Section A, 2018.09)
7	Paper	Cho, Gyuseong, Chang, Ho-Jong	Improvement of spatial resolution in a timepix based CdTe photon counting detector using ToT method (Nuclear Instruments and Methods in Physics Research, A, 2018.02)
8	Paper		Matching Condition of Direct THz-Signal Detection from On-Chip Resonating Antennas with CMOS Transistors in Non-resonant Plasma Wave Mode (Journal of Infrared, Millimeter, and Terahertz Waves, 2018.04)
9	Paper	Hong, Songcheol	Simultaneous Measurement of Thickness and Permittivity by Means of the Resonant Frequency Fitting of a Microstrip Line Ring Resonator (IEEE Microwave and Wireless Components Letters, 2018.05)
10	Paper		79-GHz Digital Attenuator-Based Variable-Gain Vector-Sum Phase Shifter With High Linearity (IEEE Microwave and Wireless Components Letters, 2018.08)
11	Paper	Park, Chong-Ook	Response to the comment on the article "New solid-state electrochemical method of measuring dissolved hydrogen in Al melt" (Sensors and Actuators B, 2018.05)
12	Paper		Microwave Frequency Generation, Switching and Controlling Using Single-Mode FP-LDs (IEEE Journal of Lightwave Technology, 2018.01)
13	Paper		Novel biconvex structure electrowetting liquid lenticular lens for 2D/3D convertible display (Scientific Reports, 2018.01)
14	Paper		Simultaneous Generation of Multiband Signals Using External Cavity-Based Fabry-Perot Laser Diode (IEEE Transactions on Microwave Theory and Techniques, 2018.01)
15	Paper	Won, Yong Hyub	Time multiplexing technique of holographic view and Maxwellian view using a liquid lens in the optical see-through head mounted display (Optics Express, 2018.01)
16	Paper		Autostereoscopic three-dimensional displays based on electrowetting liquid lenses (Optical Engineering, 2018.06)
17	Paper		Electro-wetting lenticular lens with improved diopter for 2D and 3D conversion using lens-shaped ETPTA chamber (Optics Express, 2018.07)
18	Paper		3D image crosstalk reduction by controlling the width of the electrode in a liquid lenticular lens (IEEE Photonics Journal, 2018.08)
19	Patent		Endoscopy based Fusion Medical Imaging System for Minimally Invasive Surgery (Patent registration, 10-1818654-0000, 2018.01)
20	Patent		A method for improving the accuracy of gamma dosimetry from gamma-ray spectra obtained with sintillation detectors (Patent application, 10-2018-0026968, 2018.03)
21	Patent	Cho Gyuseona	Apparatus and method for increasing spatial resolution of image (Patent registration, 10-1838951-0000, 2018.03)
22	Patent	cho, dyuseong	Multi-Radioisotope Identification Algorithm Using Artificial Neural Networks for Plastic Gamma Spectra (Patent application, 10-2018-0026957, 2018.03)
23	Patent		METHOD OF GENERATING AN IMAGE BASED ON A DIFFERENCE OF FILTER PER PIXEL, AND APPARATUSES PERFORMING THE SAME (Patent registration, 10-1852258-0000, 2018.04)
24	Patent		PET detector having arranged a large-area sensor and small area sensors on both sides and detecting method for the same (Patent registration, 10-1897606-0000, 2018.09)

Research Achievements

KAIST Institute for IT Convergence

KAIST Institute for IT Convergence

	Paper/Patent	Chief Researcher	Representative Research Achievements
25	Patent	Hong, Songcheol	DIFFERENTIAL PHASE RADAR BIO-SIGNAL DETECTION APPARATUS AND METHOD (Patent application, 10-2018-0009521, 2018.01)
26	Patent		Pulsed Doppler Radar and Operating Method of the Same (Patent registration, 10-1897862-0000, 2018.09)
27	Patent		Focus variable integral imaging AR display with focus variable liquid lens array (Patent application, 10-2018-0035266, 2018.03)
28	Patent	Won, Yong Hyub	Algorithm, strip and apparatus for salivary analysis for hematological estimation (Patent application, 10-2018-0066544, 2018.06)
29	Patent		Salivary analysis adaptor attatcheable to a general mobile phone (Patent application, 10-2018-0066543, 2018.06)

• Research Area(B5G/6G mobile communications and wireless power transfer technology)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		A Novel PAPR Reduction Scheme for OFDM System based on Deep Learning (IEEE Communications Letters, 2018.03)
2	Paper		Deep Learning Aided SCMA (IEEE Communications Letters, 2018.04)
3	Paper	Cho, Dong Ho	Deep Power Control: Transmit Power Control Scheme Based on Convolutional Neural Network (IEEE Communications Letters, 2018.06)
4	Paper		Limited Feedback Hybrid Beamforming Based on Dual Polarized Array Antenna (IEEE Communications Letters, 2018.07)
5	Paper		Performance Improvement of NOMA scheme based on Gain of Narrow and Wide Beams (IEEE Transactions on Vehicular Technology, 2018.08)
6	Paper	Gil, Gye-Tae	Estimation and Compensation for RF Chain Mismatch in UCA OAM Radio Systems (IEEE Communications Letters, 2018.08)
7	Paper	Hong Congebool	Highly linear combining CMOS PA with AAAC (Electronics Letters, 2018.08)
8	Paper	Hong, songcheor	Dynamic Feedback Linearizer of RF CMOS Power Amplifier (IEEE Microwave and Wireless Components Letters, 2018.10)
9	Patent		Antenna Apparatus including Lens Structure and Communication Method using Lens Antenna (Patent application, PCT/KR2018/000215, 2018.01)
10	Patent		Sector Grouping Method in Wireless Backhaul Apparatus and Resource Allocating Method in Wireless Backhaul Apparatus (Patent registration, 1818878, 2018.01)
11	Patent		Weight Determining Method for Beamforming and Weight Determining Apparatus for Beamforming (Patent application, PCT/KR2018/000381, 2018.01)
12	Patent		Apparatus and Method for Multiplexing Data in Wireless Communication System (Patent application, 15896672, 2018.02)
13	Patent		Method and Apparatus for Operating Idle Mode in Wireless Communication Systems (Patent registration, 9907049, 2018.02)
14	Patent	Cho, Dong Ho	Method and Apparatus for Random Access in Virtual Cell Network System (Patent registration, 9907090, 2018.02)
15	Patent		Antenna Apparatus for Millimeter Wave and Beam Generating Method using Lens (Patent registration, 1859867, 2018.05)
16	Patent		Antenna Apparatus including Lens Structure and Communication Method using Lens Antenna (Patent application, 16006113, 2018.06)
17	Patent		Apparatus and Method for Determining Beam in Wireless Communication System (Patent registration, 10057025, 2018.08)
18	Patent		Method of Retransmission in mmWave Wireless Network (Patent registration, 10064069, 2018.08)

	Paper/Patent	Chief Researcher	Representative Research Achievements
19	Patent		Data Transferring Method for Wireless Backhaul Link and Wireless Backhaul Apparatus (Patent registration, 1905310, 2018.09)
20	Patent	Cho, Dong Ho	Wireless Power Transmitter using Integrated Array Antenna, Wireless Power Transmitter using Compact MIMO Antenna and Wireless Power Transmission System (Patent application, 2018-0121715, 2018.10)
21	Patent	Cho, Dong Ho, Lee, Yong-Hoon, Kang, Joonhyuk, Lee, Ju Yong, Giil Gye-Tae	
22	Patent	Cho Dong Ho	Method for Pattern/Polarization Beam Division Multiple Access based on Massive Antennas, and an Apparatus Performing the Same (Patent application, US 15742171, 2018.01)
23	Patent	Lee, Yong-Hoon, Lee, Ju Yong,	JOINT PATTERN BEAM SECTORIZATION METHOD AND APPARATUSES PERFORMING THE SAME (Patent registration, US 9894658, 2018.02)
24	Patent	Gil, Gye-Tae	METHOD FOR MIMO TRANSMISSION AND RECEPTION BASED ON GROUP ARRAY ANTENNAS, MIMO TRANSMITTER AND MIMO RECEIVER (Patent application, 10-2018-0079259, 2018.07)
25	Patent	Cho, Dong Ho,	4 polarization antenna system for 4x4 MIMO in LOS environment (Patent application, 2018-0009779, 2018.01)
26	Patent	Lee, Ju Yong, Gil, Gye-Tae	COMMUNICATION DEVICE COMPRISING PLURALITY OF ANTENNAS HAVING DIFFERENT RADIATION PATTERN AND COMMUNITACION METHO OF USING THE COMMUNICATION DEVICE (Patent registration, 10-18833168, 2018.02)
27	Patent		VECTOR SUM CIRCUIT AND PHASE CONTROLLER USING THE SAME (Patent application, 10-2018-0005000, 2018.01)
28	Patent		POWER AMPLIFIER (Patent registration, US 9979362, 2018.05)
29	Patent	Hong, Songcheol	Variable Gain Phase Shifter (Patent registration, 10-1865612-0000, 2018.06)
30	Patent		POWER AMPLIFIER CAPABLE OF REDUCING PHASE MODULATION DISTORTION (Patent registration, 10-1890579-0000, 2018.08)
31	Patent		A Beamforming IC for 5G mobile communication system (Patent application, PCT/KR2018/010345, 2018.09)
32	Patent		RF device for minimization of return loss (Patent registration, 10-1829447-0000, 2018.02)
33	Patent	Lee, Ju Yong	APPARATUS AND METHOD FOR MULTI-TIER CLUSTERING IN WIRELESS COMMUNICATION SYSTEMS (Patent registration, 10-1880972-0000, 2018.07)
34	Patent		METHOD AND APPARATUS FOR SEAMLESS HANDOVER OPERATION IN A WIRELESS COMMUNICATION SYSTEM (Patent registration, 10-1898050-0000, 2018.09, ZL201380065589.7, 2018.10)

• Research Area(IoT/WoT)

	Paper/Patent	Chief Researcher	
1	Paper	Choi, Jun Kyun	Towards improving (Elsevier Applied E
2	Paper		Deep Learning bas (IEEE Communicat
3	Paper		Electricity Power Lo (MDPI Energies, 20
4	Paper		Scalable and Effici (Wireless Personal
5	Paper	Kim, Daeyoung	Automated detect (Medical & Biologi
6	Paper		A Multi-hop Pointe (Journal of Parallel

Research Highlights Research Achievements

KAIST Institute for IT Convergence

Representative Research Achievements

ig throughput and reducing latency: A simplified protocol conversion mechanism in distributed energy resources network Energy, 2018.03)

ased Pilot Allocation Scheme(DL-PAS) for 5G Massive MIMO System ations Letters, 2018.04)

Load Profile Extraction by Mean-Shift Clustering with Sample Pearson Correlation Coefficient Distance 2018.09)

ient Metadata Framework Towards Internet of Things I Communications Journal, 2018.03)

ction of vulnerable plaque in intravascular ultrasound images gical Engineering & Computing, 2018.11)

ter Forwarding Scheme for Efficient Location Update in Low-rate Wireless Mesh Networks el and Distributed Computing, 2018.12)

KAIST Institute for IT Convergence

	Paper/Patent	Chief Researcher	Representative Research Achievements
7	Paper	Kim, Daeyoung	Distributed topology construction in ZigBee wireless networks (Wireless Personal Communications Journal, 2018.12)
8	Patent		Pattern Tagging based Power Data Storing and Management System (Patent application, 10-2018-0012252, 2018.01)
9	Patent	Choi, Jun Kyun	SYSTEM AND METHOD FOR LOAD BALANCING IN MOBILE CLOUD NETWORK FOR PARTIAL COMPUTATION OFFLOADING (Patent application, 10-2018-0015516, 2018.02)
10	Patent		METHOD AND SYSTEM FOR CONTROLLING ACCESS TO SHARED RESOURCE USING TRUST INDEX (Patent application, 10-2018-0028449, 2018.03)
11	Patent	Jung, Sungkwan	The method and system of Mashup Application Generation for Smart Home Service (Patent application, 10-2018-0066707, 2018.06)
12	Patent		PUBLISH/SUBSCRIPTION MODEL FOR GS1 ARCHITECTURE USING GPC, SYSTEM AND METHOD IMPLEMENTING THE SAME (Patent registration, 10-1837278-0000, 2018.03)
13	Patent		Method and Apparatus for ECG Arrhythmia Classification using a Deep Convolutional Neural Network (Patent application, 10-2018-0067933, 2018.06)
14	Patent		Method and System for supporting virtualized GPU resource in Serverless computing environment (Patent application, 10-2018-0070015, 2018.06)
15	Patent	Kim, Daeyoung	Tournament Based Ranking CNN for the Cataract grading (Patent application, 10-2018-0095337, 2018.08)
16	Patent		BEACON APPARATUS USING GS1 CODE, OPERATING METHOD THEREOF AND SERVICE PROVIDING METHOD USING THE SAME (Patent registration, P-80574-US, 2018.09)
17	Patent		SYSTEM AND METHOD FOR WEB UI BASED SECURE ONS MANAGEMENT (Patent registration, 10-1913012-0000, 2018.10)
18	Patent		SYSTEM AND METHOD FOR GS1 BASED THING INFORMATION SEARCHING SERVICE (Patent registration, 10-1913013-0000, 2018.10)
19	Patent		WIRELESS ACCESS POINT USING GS1 ID AS IDENTIFICATION INFORMATION AND SMARTCITY PLATFORM INCLUDING THE SAME AS SERVICE POINT (Patent application, 10-2018-0119121, 2018.10)
20	Patent		Method and apparatus for providing augmented reality-based dynamic service (Patent registration, US20180047213A1, 2018.02)
21	Patent		Augmented-reality-based interactive authoring-service-providing system (Patent registration, US20180081448A1, 2018.03)
22	Patent		Method and system for providing feedback ui service of face recognition-based application (Patent registration, US20180121715A1, 2018.05)
23	Patent	Woo, Woontack	A FOCUS-CONTEXT DISPLAY TECHINIQUE AND APPARATUS USING A MOBILE DEVICE WITH A DUAL CAMERA (Patent application, 10-2018-0063501, 2018.06)
24	Patent		System and method for acquiring partial space in augmented space (Patent registration, US20180210627A1, 2018.07)
25	Patent		Integrated learning apparatus for lighting/object/hands recognition/tracking in augmented/virtual reality and method therefor (Patent registration, 10-1891884-0000, 2018.08)
26	Patent		User -independent Face Landmark Detection and Tracking Apparatus for Spatial Augmented Reality Interaction (Patent registration 10-1904192-0000 2018 09)

KAIST Institute for Robotics

• Research Area(RTOS for Humanoid Robots)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper	Oh, Jun Ho	Development of the Humanoid Disaster Response Platform DRC-HUBO (IEEE TRANSCTIONS ON ROBOTICS, 2018.02)

	Paper/Patent	Chief Researcher	
2	Paper	Oh, Jun Ho	Robots for the Pye (SCIENCE ROBOTI
3	Paper	Oh, Jun Ho	Balance recovery (ROBOTICS AND A
4	Paper	Oh, Jun Ho	Development of a (INTERNATIONAL
5	Paper	Oh, Jun Ho	Position/torque hy (ADVANCED ROB
6	Paper	Oh, Jun Ho	Collision Detection (JOURNAL OF INT
7	Paper	Oh, Jun Ho	Biped robot state (ROBOTICS AND A

• Research Area(Mobile Intelligence)

	Paper/Patent	Chief Researcher	
1	Paper	King the Mile of	Trajectory Design o (Journal of Guidand
2	Paper		Coastal Navigation (Journal of Institute
3	Paper		An Autonomous Ae (AEROSPACE SCIEN
4	Paper		A Direct Visual Serv (JOURNAL OF FIELD
5	Paper	Shim, Hyun chul	Development of a s (INTERNATIONAL J
6	Paper		Spline-based RRT* (JOURNAL OF INTE
7	Paper		Perception, Guidan (IEEE Robotics and
8	Paper		Robotic Herding of (IEEE TRANSACTIO
9	Paper		A Mini-drone Devel (INTERNATIONAL J
10	Paper		Visual servoing fran (Proceedings of the
11	Patent	Kim, Jin Whan	SIMULATION APPA (Patent registration

• Research Area(Al for Cooperative Robots)

	Paper/Patent	Chief Researcher	
1	Paper		A stochastic game- (Unmanned System
2	Paper		Cooperative multi- (AIAA Journal of A
3	Paper	Choi, Han-Lim	Iterative methods f (International Journ
4	Paper		Efficient sensor net (International Journ
5	Paper		Approximate infere (IEEE Robotics and

Research Highlights Research Achievements Faculty Information

KAIST Institute for Robotics

Representative Research Achievements

veongChang 2018 Winter Olympic Games

through model predictive control based on capture point dynamics for biped walking robot AUTONOMOUS SYSTEMS, 2018.07)

a Tele-Operated Rescue Robot for a Disaster Response L JOURNAL OF HUMANOID ROBOTICS, 2018.08)

ybrid control of a rigid, high-gear ratio quadruped robot 30TICS, 2018.09)

n and Safe Reaction Algorithm for Non-backdrivable Manipulator with Single-Force/Torque Sensor

TELLIGENT & ROBOTIC SYSTEMS, 2018.09)

e estimation using compliant inverted pendulum model AUTONOMOUS SYSTEMS, 2018.10)

Representative Research Achievements

of Underwater Gliders for Maximum Advance Speed in Finite-Depth Water Ice, Control and Dynamics, 2018.05)

with Marine Radar for USV Operation in GPS-Restricted Situations

e of Control, Robotics and Systems, 2018.08)

erial Combat Framework for Two-on-Two Engagements Based on Basic Fighter Maneuvers

NCE AND TECHNOLOGY, 2018.01)

voing-based Framework for 2016 IROS Autonomous Drone Racing Challenge D ROBOTICS, 2018.01)

self-driving car that can handle the adverse weather JOURNAL OF AUTOMOTIVE TECHNOLOGY, 2018.02)

¹ Using Piecewise Continuous Collision-checking Algorithm for Car-like Vehicles

ELLIGENT & ROBOTIC SYSTEMS, 2018.06)

nce and Navigation for Indoor Autonomous Drone Racing using Deep Learning

l Automation Letters, 2018.07) f a Flock of Birds Using an Unmanned Aerial Vehicle

ONS ON ROBOTICS, 2018.08)

elopment, Genetic Vector Field-Based Multi-agent Path Planning, and Flight Tests JOURNAL OF AERONAUTICAL AND SPACE SCIENCES, 2018.09)

mework using Gaussian process for an aerial parallel manipulator e Institution of Mechanical Engineers, G: Journal of Aerospace Engineering, 2018.09)

ARATUS AND SIMULATION METHOD FOR EVALUATION OF PERFORMANCE OF UNDERWATER VIDEO MOSAICKING ALGORITHM n, 10-1863744, 2018.05)

Representative Research Achievements

P-based approach for multiple beyond-visual-range air combat ns, 2018.01)

agent based algorithm for evacuation planning for victims with difference urgency erospace Information Systems, 2018.02)

for efficient sampling-based optimal motion planning of nonlinear systems nal of Applied Mathematics and Computer Science, 2018.03)

etwork planning based on approximate potential games rnal of Distributed Sensor Networks, 2018.06)

ence-based motion planning by learning and exploiting low-dimensional latent variable models I Automation Letters, 2018.10)

KAIST Institute for Robotics

	Paper/Patent	Chief Researcher	Representative Research Achievements
6	Paper		Fast and Reliable Minimal Relative Pose Estimation under Planar Motion (Image and Vision Computing, 2018.01)
7	Paper		Deep ART Neural Model for Biologically Inspired Episodic Memory and Its Application to Task Performance of Robots (IEEE Transactions on Cybernetics, 2018.06)
8	Paper		Feature-based Hand Gesture Recognition Using an FMCW Radar and its Temporal Feature Analysis (IEEE Sensors Journal, 2018.07)
9	Paper		Developmental Resonance Network (IEEE Transactions on Neural Networks and Learning Systems, 2018.08)
10	Paper	Kim, Jong-Hwan	Incremental Class Learning for Hierarchical Classification (IEEE Transactions on Cybernetics, 2018.09)
11	Patent		Hierarchical classification-based incremental class learning method and computing device for digital storytelling (Patent application, 10-2018-0124477, 2018.01)
12	Patent		Broadcasting Image Equipment using Multi-Joint Movement Manipulator and Method of Controlling thereof (Patent registration, 10-2016-0168535, 2018.01)
13	Patent		METHOD AND APPARATUS FOR RGB-D DENSE VISUAL ODOMETRY BASED ON BACKGROUND MODEL IN A DYNAMIC ENVIRONMENT (Patent registration, 10-2016-0135992, 2018.06)
14	Patent		TASK PERFORMING ROBOT AND METHOD BASED ON HUMAN ROBOT INTERACTION (Patent registration, 10-2016-0041858, 2018.06)
15	Patent		Robot ureteroscope system (Patent application, 10-2018-0042794, 2018.04)
16	Patent		A TRANSLATION TYPE OF DELTA ROBOT AND A SURGICAL ROBOT COMPRISING THEREOF (Patent registration, 10-1848994-0000, 2018.04)
17	Patent	Kuran Dang Saa	REDICTION SYSTEM USING A THERMAL IMAGERY CAMERA AND FALL PREDICTION METHOD USING A THERMAL IMAGERY CAMERA (Patent application, 10-2018-0057797, 2018.05)
18	Patent	Kwon, Dong-Soo	ATTACHABLE TYPE CONTROLLING SYSTEM FOR COMMERCIAL SURGICAL APPARATUS (Patent registration, 10-1882093-0000, 2018.07)
19	Patent		POSITIONING ROBOT (Patent registration, 10-1895705-0000, 2018.08)
20	Patent		JOINT ASSEMBLY (Patent registration, 10-1932392-0000, 2018.12)

KAIST Institute for the NanoCentury

• Research Area(NT for Climate Change)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Designing redox-stable cobalt-polypyridyl complexes for redox flow batteries: spin crossover delocalizes excess charge (Advanved Energy Materrals, 2018.01)
2	Paper		Critically examining the role of nanocatalysts in Li-O ₂ batteries: viability towards suppression of recharge overpotential, rechargeability and cyclability (ACS Energy Letters, 2018.02)
3	Paper	Буоп, пуе кушід	Determining the facile routes for oxygen evolution reaction by in situ probing of $Li-O_2$ cells with conformal Li_2O_2 films (Journal of Physical Chemistry C, 2018.08)
4	Paper		Nanostructuring one-dimensional and amorphous lithium peroxide for high round-trip efficiency in lithium-oxygen batteries (Nature Communications, 2018.09)
5	Paper	Choi, Siyoung	A new method to produce cellulose nanofibrils from microalgae and the measurement of their mechanical strength (Carbohydrate Polymers, 2018.01)
6	Paper		Static and Dynamic Permeability Assay for Hydrophilic Small Molecules Using a Planar Droplet Interface Bilayer (Analytical Chemistry, 2018.01)

	Paper/Patent	Chief Researcher	
7	Paper		Nonlinear chiral rheology (Soft Matter, 2018.03)
8	Paper	Chai Siyoung	Calcium–Modified Silk as (Advanced Functional Mat
9	Paper	Choi, siyoung	Blending Mechanism of P (Langmuir, 2018.10)
10	Paper		Solvent-free Deposition of (ACS Applied Materials &
11	Paper	loop Sockwoo	3D nanostructured N-dop (Nanoscale, 2018.05)
12	Paper	Jeon, Seokwoo	Low-Cost Black Phosphore (ACS Applied Materials &
13	Paper	lung Haa Taa	Highly Efficient and Stable (ACS Sustainable Chemist
14	Paper	Jung, nee ide	Z-scheme Photocatalytic C (ACS Catalysis, 2018.04)
15	Patent	Choi, Siyoung	Method for preparing pore (Patent registration, 10-18
16	Patent		Method of simultaneous of (Patent registration, 10-18
17	Patent	loon Cookwoo	3D Percolated Nano-netw (Patent registration, 10-18
18	Patent	JEUII, SEUKWUU	ELECTROCHEMICAL SENS (Patent registration, 10-19
19	Patent		Fabrication of Bicontinuou (Patent registration, 10-19

• Research Area(NT for Healthcare)

	Paper/Patent	Chief Researcher	
1	Paper	Jung, Hee Tae	Metallic Ti ₃ C ₂ T _x MX (ACS Nano[selecte
2	Paper		Hierarchical Metal (ACS Applied Mate
3	Paper	Kim, Il-Doo	In-situ Coupling of (ACS Central Scien
4	Paper		Sub-Parts-per-Milli (Analytical Chemis
5	Paper		Layer-by-layer siRN (Scientific Reports,
6	Paper		Tannin-Titanium O (ACS Applied Mate
7	Paper	Nam, Yoon Sung	Paclitaxel-induced (Chemical Commu
8	Paper		DNA-mediated Sel (Biomaterials Scier
9	Paper		Cancer-targeted Re (Journal of Materia
10	Patent	Kim, Il-Doo	Gas sensor using i manufacturing me (Patent registration

Research Highlights Research Achievements

KAIST Institute for the NanoCentury

eology of phospholipid monolayers 3.03)

Silk as a Biocompatible and Strong Adhesive for Epidermal Electronics onal Materials, 2018.09)

ism of PS-b-PEO and PS Homopolymer at the Air/Water Interface and Their Morphological Control

osition of Ultrathin Copolymer Films with Tunable Viscoelasticity for the Application to Pressure Sensitive Adhesives terials & Interfaces, 2018.10)

d N-doped TiO₂ photocatalysts with enhanced visible absorption 3.05)

hosphorus Nanofillers for Improved Thermoelectric Performance in PEDOT: PSS Composite Films

terials & Interfaces, 2018.05)

nd Stable CO₂ Reduction Photocatalyst with a Hierarchical Structure of Mesoporous TiO₂ on 3D Graphene with Few-Layered MoS₂ Chemistry & Engineering, 2018.04)

atalytic CO₂ Conversion on Three-Dimensional BiVO₄/Carbon-Coated Cu₂O Nanowire Arrays under Visible Light

ring porous sorbent for sewage sludge incineration gas on, 10-1833775-0000, 2018.02)

aneous debundling and exfoliation of carbon nanotube and graphene on, 10-1830111-0000, 2018.02)

ano-networks for Highly Stretchable and Sensitive Strain Sensor on, 10-1887481-0000, 2018.08)

CAL SENSOR INCLUDING 3-DIMENSIONAL NANO-PATTERNED ELECTRODE on, 10-1902382-0000, 2018.09)

continuous stretchable 3D nanostructured materials and application of Scattering at the interface of porous structure by stretching on, 10-1902380-0000, 2018.09)

Kene Gas Sensors with Ultrahigh Signal-to-Noise Ratio

ed as ACS Editor's Choice], Front Cover, 2018.01)

-Organic Framework Assembled Membrane Filter for Efficient Removal of Particulate Matter erials & Interfaces, 2018.06)

f Multidimensional MOFs for Heterogeneous Metal Oxide Architectures: Toward Sensitive Chemiresistor nce, 2018.07)

lion Hydrogen Sulfide Colorimetric Sensor: Lead Acetate Anchored Nanofibers toward Halitosis Diagnosis istry, 2018.08)

VA/poly(L-lysine) Multilayers on Polydopamine-coated Surface for Efficient Cell Adhesion and Gene Silencing 2018.05)

xide Multilayer as a Photochemically Suppressed Ultraviolet Filter erials & Interfaces, 2018.08)

Formation of 3D Nanocrystal Superlattices within Injectable Protein-based Hybrid Nanoparticles

unications, 2018.09)

If-assembly of Taste Cells and Neurons for Taste Signal Transmission ence, 2018.10)

eactive Oxygen Species-degradable Polymer Nanoparticles for Near Infrared Light-induced Drug Release ials Chemistry B, 2018. 10)

nterconnected multi-dimensional porosity loaded METAL OXIDE nanofiberS functionalized by nanoparticle catalyst, and thod thereof

on, 10-1893326, 2018.08)

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	Paper/Patent	Chief Researcher	Representative Research Achievements
11	Patent	Kim, Il-Doo	Gas sensor member using Two-dimensional porous metal oxide nanosheets and method for manufacturing gas sensor member (Patent registration, 10-1887281, 2018.08)
12	Patent		COLORIMETRIC DRUG SENSORS WITH DRUG DETECTING COLOR CHANGE DYE ANCHORED ONE DIMENSIONAL NANOFIBER MEMBRANE AND MANUFACTURING METHOD THEREOF (Patent application, 10-2018-0119657, 2018.10)
13	Patent	Nam, Yoon Sung	Biosensor based on gustatory and neuronal cells (Patent application, 10-2018-0117597, 2018.10)

• Research Area(NT for Advanced Opto-Electronics)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Flexible and Transparent Graphene Electrode Architecture with Selective Defect Decoration for Organic Light-Emitting Diodes (Advanced Functional Materials, 2018.01)
2	Paper	Choi, Sung-Yool	A Recoverable Synapse Device Using a Three–Dimensional Silicon Transistor (Advanced Functional Materials, 2018.10)
3	Paper		Improved Electrical Contact Properties of MoS ₂ -Graphene Lateral Heterostructure (Advanced Functional Materials, 2018.12)
4	Paper		Two-Dimensional WO $_3$ Nanosheets Chemically Converted from Layered WS $_2$ for High-Performance Electrochromic Devices (Nano Letters, 2018.08)
5	Paper	Jeon, Seokwoo	Efficient Solid-State Photoluminescence of Graphene Quantum Dots Embedded in Boron Oxynitride for AC-Electroluminescent Device (Advanced Materials, 2018.08)
6	Paper	hung Has Tee	Pore-Size-Tuned Graphene Oxide Frameworks as Ion-Selective and Protective Layers on Hydrocarbon Membranes for Vanadium Redox-Flow Batteries (Nano Letters, 2018.05)
7	Paper	Jung, Hee Tae	Springtail-inspired superomniphobic surface with extreme pressure resistance (Science Advances, 2018.08)
8	Paper		Laser irradiation of metal oxide films and nanostructures: applications and advances (Advanced Materials, 2018.04)
9	Paper		Monolithic Flexible Vertical GaN Light-Emitting Diodes for Transparent Wireless Brain Optical Stimulator (Advanced Materials, 2018.05)
10	Paper		Flexible Wireless Powered Drug Delivery System for Targeted Administration on Cerebral Cortex (Nano Energy, 2018.06)
11	Paper	Loo Koon loo	Novel Electronics for Flexible and Neuromorphic Computing (Advanced Functional Materials, 2018.07)
12	Paper	Lee, Reon Jae	Trichogenic Photostimulation Using Monolithic Flexible Vertical AlGaInP Light-Emitting Diodes (ACS Nano, 2018.08)
13	Paper		Basilar Membrane-Inspired Self-Powered Acoustic Sensor Enabled by Highly Sensitive Multi Tunable Frequency Band (Nano Energy, 2018.08)
14	Paper		Machine Learning-based Self-powered Acoustic Sensor for Speaker Recognition (Nano Energy, 2018.09)
15	Paper		Flash-Induced Stretchable Cu Conductor via Multiscale-Interfacial Couplings (Advanced Science, 2018.10)
16	Paper		An extended analytic model for the elastic properties of platelet-staggered composites and its application to 3D printed structures (Composite structures, 2018.01)
17	Paper	Ryu, Seunghwa	A micromechanics-based analytical solution for the effective thermal conductivity of composites with orthotropic matrices and interfacial thermal resistance (Scientific reports, 2018.05)
18	Paper	See Muungour	Mesoporous microcapsules controlling transmembrane transport by pore size (Chemistry of Materials, 2018.04)
19	Paper	Seo, Myungeun	Hierarchically porous polymer containing micro-/meso-/macropores (Chemical Communications, 2018.07)

	Paper/Patent	Chief Researcher	Representative Research Achievements
20	Paper		Permselective mesoporous polymer membranes for vanadium redox flow batteries (ACS Applied Materials & Interfaces, 2018.11)
21	Paper	Seo, Myungeun	Mixed matrix membranes possessing covalently anchored metal-organic frameworks for gas separation (Journal of Materials Chemistry A, 2018.11)
22	Paper		Creation of size-controlled micropores by functional group removal (ACS Macro Letters, 2018.12)
23	Paper	Vu Kuqupasik	High-efficiency broadband light coupling between optical fibers and photonic integrated circuits (Nanophotonics, 2018.10)
24	Paper	ru, kyöüngsik	Coupling performance enhancement using SOI grating coupler design (Optics Communications, 2018.11)
25	Patent	Choi, Sung-Yool	Electronic device using two dimensional semiconductor material (Patent application, US-16/226,950, 2018.12)
26	Patent		Thin film transistor comprising two dimensional material, display comprising the same and manufacturing method for the same (Patent application, US-16/226,897, 2018.12)
27	Patent	Yu, Kyoungsik	Black and White Display by Phase-changing Molybdenum Ditelluride (Patent application, 10-2018-0159856, 2018.12)

• Research Area(Neuroimaging and Neuromodulation)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Hippocampal Subfields Volume Reduction in High Schoolers with Previous Verbal Abuse Experiences (Clinical Psychopharmacology and Neuroscience, 2018.02)
2	Paper	Jeong, BumSeok	The effects of GRIN2B and DRD4 gene variants on local functional connectivity in attention-deficit/hyperactivity disorder (Brain Imaging and Behavior, 2018.02)
3	Paper		Treatment Effect of Methylphenidate on Intrinsic Functional Brain Network in Medication-naive ADHD Children: A Multivariate Analysis (Brain Imaging and Behavior, 2018.04)
4	Paper		Momentary level of slow default mode network activity is associated with distinct propagation and connectivity patterns in the anesthetized mouse cortex (JOURNAL OF NEUROPHYSIOLOGY, 2018.02)
5	Paper		Classification of Spatiotemporal Neural Activity Patterns in Brain Imaging Data (SCIENTIFIC REPORTS, 2018.05)
6	Paper	loong Yong	Altered Brain Function in Persistent Postural Perceptual Dizziness: A Study on Resting State Functional Connectivity (HUMAN BRAIN MAPPING, 2018.08)
7	Paper	Jeong, rong	Vascular and Neurogenic Rejuvenation in Aging Mice by Modulation of ASM (Neuron, 2018.09)
8	Paper		Neural substrates of cognitive reserve in Alzheimer's disease spectrum and normal aging (Neuroimage, 2018.11)
9	Paper		Alzheimer's Disease Neuroimaging Initiative. Comparison of Amyloid β and Tau Spread Models in Alzheimer's Disease (Cereb Cortex, 2018.12)
10	Patent	loong RumSock	EEG signal variability based analysis system for depression diagnosis and the method thereof (Patent application, 10-2018-0122465, 2018.09)
11	Patent	Jeong, BumSeok	Methods and systems for decoding emotional processing using interoception-relates brain waves (Patent application, 10-2018-0122305, 2018.10)

• Research Area(Biophotonics)

	Paper/Patent	Chief Researcher	
1	Paper	Kim, Pilhan	Effect of resveratro (Islets, 2018.01)

KAIST Institute Overview

Research Highlights

Research Achievements

KAIST Institute for the NanoCentury

KAIST Institute for Health Science and Technology

ol treatment on graft revascularization after islet transplantation in streptozotocin-induced diabetic mice

Research Achievements

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KAIST Institute for Health Science and Technology

	Paper/Patent	Chief Researcher	Representative Research Achievements
2	Paper		Highly Angiogenic, Nonthrombogenic Bone Marrow Mononuclear Cell–Derived Spheroids in Intraportal Islet Transplantation (Diabetes, 2018.03)
3	Paper		Intravital imaging of a pulmonary endothelial surface layer in a murine sepsis model (Biomedical Optics Express, 2018.05)
4	Paper	Kim, Pilhan	Nanoparticle-Assisted Transcutaneous Delivery of a Signal Transducer and Activator of Transcription 3-Inhibiting Peptide Ameliorates Psoriasis-like Skin Inflammation (ACS NANO, 2018.06)
5	Paper		Quantitative two-photon microscopy imaging analysis of human skin to evaluate enhanced transdermal delivery by hybrid-type multilamellar nanostructure (Biomedical Optics Express, 2018.08)
6	Paper		Intravascular Optical Molecular Imaging of a Macrophage Subset Within Intraplaque Hemorrhages (JACC: Cardiovascular Imaging, 2018.02)
7	Paper		Multispectral analog-mean-delay fluorescence lifetime imaging combined with optical coherence tomography (Biomedical Optics Express, 2018.04)
8	Paper	Ob Wangyubl	Wide dynamic range high-speed three-dimensional quantitative OCT angiography with a hybrid-beam scan (Optics Letters, 2018.05)
9	Paper	on, wangyum	Quantitative hemodynamic analysis of cerebral blood flow and neurovascular coupling using optical coherence tomography angiography (Journal of Cerebral Blood Flow & Metabolism, 2018.05)
10	Paper		Oxygen-Induced Retinopathy and Choroidopathy: In Vivo Longitudinal Observation of Vascular Changes Using OCTA (Investigative opthalmology & visual science, 2018.07)
11	Paper		Comprehensive intravascular imaging of atherosclerotic plaque in vivo using optical coherence tomography and fluorescence lifetime imaging (Scientific Reports, 2018.09)
12	Patent		Pharmaceutical composition for preventing or treating immunocyte migration-related diseases comprising benzo[d]thiazole derivatives (Patent application, 10-2018-0010398, 2018.01)
13	Patent		Lung window apparatus based on micro-suction for in vivo microscopic imaging of lung tissue and method for obtaining image using the same (Patent application, 2018-530459, 15/756, 478, 16842282.2, 201680062579.X, 2018.02)
14	Patent	Kim Bilbon	Window apparatus for in vivo microscopic imaging of mammary tissue and method for obtaining image using the same (Patent application, 2018-530458, 15/756, 394, 16842281.4, 201680062598.4, 2018.02)
15	Patent	Kiili, Fiilidii	APPARATUS AND METHOD FOR IMAGE PROCESSING (Patent registration, 10-1831820, 2018.02)
16	Patent		CONFOCAL MICROSCOPY AND METHOD OF PROCESSING IMAGE USING THE SAME (Patent registration, 10-1898220, 2018.09)
17	Patent		System for in vivo microscopic imaging of deep tissue, and microscopic imaging method (Patent application, 10-2018-0155498, 2018.12)
18	Patent	Kim, Pilhan, Oh, Wangyuhl	ANTI-ANGIOPOIETIN-2 ANTIBODY (Patent application, 62633038, 2018.02)
19	Patent	Oh, Wangyuhl	METHOD OF PERFORMING OCT IMAGING BY AVOIDING SYSTOLE, AND APPARATUSES PERFORMING THE SAME (Patent registration, 10-1851058-0000, 2018.04)

• Research Area(Therapeutic Bioengineering)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Enhanced Performance of a Molecular Photoacoustic Imaging Agent by Encapsulation in Mesoporous Silicon Nanoparticles (Advanced Materials, 2018.05)
2	Paper		Immunogene Therapy Using Fusogenic Nanoparticles Modulates Macrophage Response to Staphylococcal aureus infection (Nature Communications, 2018.05)
3	Paper	Dark III.	Macrophage-Mediated Exocytosis of Elongated Nanoparticles Improves Hepatic Excretion and Cancer Phototherapy (ACS Applied Materials & Interfaces, 2018.08)
4	Paper	Park, Ji Ho	Single-Molecule Co-Immunoprecipitation Reveals Functional Inheritance of EGFRs in Extracellular Vesicles (Small, 2018.10)
5	Patent		MULTIPLE COLUMN CHROMATOGRAPHY AND METHOD FOR ISOLATING EXOSOMES (Patent application, 10-2018-0019894, 2018.02)
6	Patent		Cargo-switching dissociable nanobiomaterial for treatment of atherosclerosis (Patent application, 10-2018-0037447, 2018.03)

	Paper/Patent	Chief Researcher	
7	Patent	Park, Ji Ho	Method for Isolat (Patent applicatio
8	Patent	Park, Ji Ho, Kim, Pilhan	Apparatus and m (Patent registration

• Research Area(Al Fundamentals)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Improving Distantly Supervised Relation Extraction by Knowledge Base-driven Zero Subject Resolution (IEICE Transactions on Information and Systems, 2018.08)
2	Paper	Choi, Key-Sun	Multi-sense Word Embedding to Improve Performance of a CNN-based Relation Extraction Model (Journal of KIISE, 2018.08)
3	Paper		Knowledge Base Population Model Using Non-Negative Matrix Factorization (Journal of KIISE, 2018.09)
4	Paper	Lee, Soo-Young	Rescoring of N-best Hypotheses using Top-Down Selective Attention for Automatic Speech Recognition (IEEE Signal Processing Letters, 2018.02)
5	Patent	Choi Kay Sup	Open Information Extraction Method and System for Extracting Reified Ternary Facts (Patent registration, 10-1831058-0000, 2018.02)
6	Patent	Choi, Rey-Sun	Open Information Extraction Method and System for Extracting Reified Ternary Facts (Patent application, PCT/KR2016/010902, 2018.08)
7	Patent	Jeong, Bumseok	Method and Apparatus for Item Selection Based on Machine Learning for Rapid Screening of Anxiety and Depression in Multiple Psychological Test Sites (Patent application, 10-2018-0071641, 2018.06, PCK/KR2018/007056, 2018.06)
8	Patent		Method of Text to Speech and System of the Same (Patent application, 10-2018-0055494, 2018.05)
9	Patent		Method and System of Text to Multiple Speech (Patent application, 10-2018-0061356, 2018.05)
10	Patent		Continuous Authentication System Using Eye Response (Patent application, PCT/KR2018/006531, 2018.06)
11	Patent		Method and Apparatus for Removal of Personal Identification Using Generative Model (Patent application, PCT/KR2018/007078, 2018.06)
12	Patent		A Method of Simultaneous Recognition for Emotion, Age, and Gender Based on Users' Voice Signal (Patent application, PCT/KR2018/007163, 2018.06, 10-2018-0071462, 2018.06)
13	Patent		Intelligent Personal Assistant System Based on the Inner State of User (Patent application, 10-2018-0071384, 2018.06)
14	Patent	Lee, 500-Toung	Method and Apparatus for Removal of Personal Identification Using Generative Model (Patent application, 10-2018-0071835, 2018.06)
15	Patent		A Multimodal System for Simulataneous Emotion, Age and Gender Recognition (Patent application, 10-2018-0071850, 2018.06)
16	Patent		User Authenticaions System and Method Based on Eye Responses Evoked from Visual Stimuli (Patent application, 10-2018-0081184, 2018.07)
17	Patent		User Authentication System Using Eye Response and User Information (Patent application, 10-2018-0081204, 2018.07)
18	Patent		User Authentication System Using Low-resolution Pupil Reaction (Patent application, 10-2018-0081212, 2018.07)
19	Patent		Continuous Authentication System Using Eye Response (Patent application, 10-2018-0081216, 2018.07)

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Research Achievements Faculty Information

KAIST Institute for Health Science and Technology

tion of Exosomes and Lipoproteins from Biological Sample ion, 10-2018-0031629, 2018.03)

nethod of processing image of targeting material for circulating cells ion, 10-1822930, 2018.01)

KAIST Institute for Artificial Intelligence

Research Achievements

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KAIST Institute for Artificial Intelligence

• Research Area(AI Applications)

	Paper/Patent	Chief Researcher	Representative Research Achievements
	1 Paper	Lee, Jae-Gil	Study on Detecting Guest Revisit Patterns in Indoor Tracking Data (Database Research, 2018.08)
	2 Paper	Park, Hyun Wook	Triple-frame-based Bi-directional Motion Estimation for Motion Compensated Frame Interpolation (IEEE Transactions on Circuits and Systems for Video Technology, 2018.05)
	3 Paper	Park, Yong-Hwa	Flexible Piezoelectric Liquid Volume Sensor (Sensors and Actuators A-Physical, 2018.04)
	4 Paper		Deep Learning with Domain Adaptation for Accelerated Projection-Reconstruction MR (Magnetic Resonance in Medicine, 2018.01)
	5 Paper		Alteration in the Local and Global Functional Connectivity of Resting State Networks in Parkinson's Disease (Journal of Movement Disorders, 2018.01)
	6 Paper		Deep Convolutional Framelets: A General Deep Learning Framework for Inverse Problems (SIAM Journal on Imaging Sciences, 2018.01)
	7 Paper		Topological Sensitivity based Far-field Detection of Elastic Inclusions (Results in Physics, 2018.03)
	8 Paper		Sparse and Low-Rank Decomposition of a Hankel Structured Matrix for Impulse Noise Removal (IEEE Transactions on Image Processing, 2018.03)
	9 Paper	Ve Jong Chul	Deep Residual Learning for Accelerated MRI using Magnitude and Phase Networks (IEEE Transactions on Biomedical Engineering, 2018.04)
1	10 Paper	te, Jong Chui	Deep Convolutional Framelet Denosing for Low-Dose CT via Wavelet Residual Network (IEEE Transactions on Biomedical Engineering, 2018.04)
1	11 Paper		Framing U-Net via Deep Convolutional Framelets: Application to Sparse-view CT (IEEE Transactions on Medical Imaging, 2018.04)
1	12 Paper		Image Reconstruction Is a New Frontier of Machine Learning (IEEE Transactions on Medical Imaging, 2018.05)
1	I 3 Paper		A Mathematical Framework for Deep Learning in Elastic Source Imaging (SIAM Journal on Applied Mathematics, 2018.05)
1	14 Paper		Grid-Free Localization Algorithm Using Low Rank Hankel Matrix For Super-Resolution Microscopy (IEEE Transactions on Image Processing, 2018.06)
1	15 Paper		Efficient B-mode Ultrasound Image Reconstruction from Sub-sampled RF Data using Deep Learning (IEEE Transactions on Medical Imaging, 2018.08)
1	16 Patent	Lee, Jae-Gil	Fall Detection System and Method (Patent registration, 10-1860062-0000, 2018.05)
1	17 Patent	Park, Hyun Wook	Apparatus and Method for Motion Compensated Frame Interpolation Suitable for both Linear and Nolinear Motion (Patent application, 10-2018-0101422, 2018.08)
1	18 Patent		Illumination Optical System and 3D Image Acquisition Apparatus Including the Same (Patent registration, 9874637, 2018.01)
1	I9 Patent	Park, Yong-Hwa	Optical Modulator Including Multiple Quantum Well and Carrier Blocks and 3D Image Acquisition Apparatus Including the Same (Patent registration, 9904078, 2018.02)
2	20 Patent		3D Image Acquisition Apparatus and Method of Driving the Same (Patent registration, 9894347, 2018.02)
2	21 Patent		Method and Apparatus for X-ray Computed Tomography Image Processing using Artificial Neural Network (Patent application, 10-2018-0004293, 2018.01)
2	22 Patent	Valore Chul	Method for Processing X-ray Computed Tomography Image using Artificial Neural Network and Apparatus Therefor (Patent application, 10-2018-0041965, 2018.04)
2	23 Patent	re, Jong Chui	Method for Removing Ghost Artifact from Magnetic Resonance Image and Magnetic Resonance Device Therefor (Patent application, 16857605.6, 2018.04)
2	24 Patent		An Image Processing Apparatus using Neural Network and a Method Performed by the Image Processing Apparatus (Patent application, 10-2018-0056648, 2018.05)

	Paper/Patent	Chief Researcher	
25	Patent		Method for Process (Patent application
26	Patent	Ye, Jong Chul	Method for Process (Patent application
27	Patent		Method for Process (Patent application
28	Patent		Method and Appar (Patent application
29	Patent		Image Segmentatic (Patent application
30	Patent		Method and Appar (Patent application
31	Patent		Method for Removi (Patent application
32	Patent		Method for Process (Patent application,

• Research Area(Al Emergings)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper		Wearable Sweat Rate Sensors for Human Thermal Comfort Monitoring (Scientific Reports, 2018.01)
2	Paper	Cho, Young-Ho	Resonating Tactile Stimulators Based on Piezoelectric Polymer Films (Journal of Mechanical Science and Technology, 2018.02)
3	Paper		Evaluation of Skin Hardness as a Physiological Sign of Human Thermal Status (Scientific Reports, 2018.08)
4	Paper		Medial Preoptic Circuit Induces Hunting-like Behavior to Target Objects and Prey (Nature Neuroscience, 2018.01)
5	Paper		Rebound Excitability Mediates Motor Abnormalities in Parkinson's Disease (BMB Reports, 2018.01)
6	Paper		Optogenetic Control of Body Movements via Flexible Vertical Light-emitting Diodes on Brain Surface (Nano Energy, 2018.02)
7	Paper	Kim, Daesoo	Monolithic Flexible Vertical GaN Light–Emitting Diodes for a Transparent Wireless Brain Optical Stimulator (Advanced Materials, 2018.05)
8	Paper		Nodding Behavior Couples to Vigilance Fluctuation in a High-calorie Diet Model of Drowsiness (Molecular Brain, 2018.06)
9	Paper		Trichogenic Photostimulation Using Monolithic Flexible Vertical AlGaInP Light-Emitting Diodes (ACS Nano, 2018.09)
10	Paper		Flexible Wireless Powered Drug Delivery System for Targeted Administration on Cerebral Cortex (Nano Energy, 2018.09)
11	Paper		Reinforcement Learning: from Algorithms to Neuroscience (Communications of KIISE, 2018.01)
12	Paper	Lee, Sang Wan	Model-based and Model-free Pain Avoidance Learning (Brain and Neuroscience Advances, 2018.05)
13	Paper		Decoupling between Causal Understanding and Awareness during Learning and Inference (bioRxiv, 2018.08)

KAIST Institute Overview Research Highlights Research Achievements

KAIST Institute for Artificial Intelligence

Representative Research Achievements

ssing Sparse-view Computed Tomography Image using Artificial Neural Network and Apparatus Therefor n, 10-2018-0060849, 2018.05)

ssing Interior Computed Tomography Image using Artificial Neural Network and Apparatus Therefor n, 10-2018-0060853, 2018.05, 10-2018-0064261, 2018.06)

sing Multi-directional X-ray Computed Tomography Image using Artificial Neural Network and Apparatus Therefor n, 10-2018-0064077, 2018.06)

aratus for Reconstructing Image Based on Neural Network n, 10-2018-0070873, 2018.06)

ion Method using Artificial Neural Network and Apparatus n, 10-2018-0090659, 2018.08)

aratus for Processing Image Based on Neural Network n, 16109963, 2018.08)

ving Ghost Artifact of Echo Planar Imaging by using Neural Network n, 10-2018-0102146, 2018.08)

ssing Unmatched Low-dose Computed Tomography Image using Artificial Neural Network and Apparatus Therefor n, 10-2018-0121769, 2018.10)

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KAIST Institute for Artificial Intelligence

	Paper/Patent	Chief Researcher	Representative Research Achievements
14	Paper		Effects of Depression on Prefrontal Striatal Goal Directed and Habitual Control (bioRxiv, 2018.08)
15	Paper	Lee, Sang Wan	Task Complexity Interacts with State-space Uncertainty in the Arbitration Process between Model-based and Model-free Reinforcement-learning at both Behavioral and Neural Levels (bioRxiv, 2018.08)
16	Paper		Model-based Reinforcement Learning using Probabilistic Simulation (Journal of Korean Institute of Intelligent Systems, 2018.10)
17	Patent	Cho, Young-Ho	Elasticity Measurement Apparatus (Patent application, PCT/KR2018/008340, 2018.07)
18	Patent	Kim, Daesoo	Methods for Treating Parkinson's Disease (Patent application, 15962984, 2018.04)
19	Patent		Apparatus and Method for Eliciting Optimal Strategy of the Humans in the Interactive Games Using Aprificial Intelligence (Patent application, 10-2018-0089185, 2018.07)
20	Patent		Apparatus and Method for Non-invasive Control of Human Learning and Inference Process at Behavior and Neural Levels Based upon Brain-inspired Artificial Intelligence Technique (Patent application, 10-2018-0089186, 2018.07)
21	Patent	Lee, Sang Wan	Method for Adaptive EEG Signal Processing Using Reinforcement Learning and System Using the Same (Patent application, 10-2018-0094220, 2018.08)
22	Patent		Method and Apparatus of Brain-computer Interface Design for Estimating Choice Behavior and Decision Strategy (Patent application, 10-2018-0103732, 2018.08)
23	Patent		Method and Apparatus for Early Diagnosis of Depression (Patent application, 10-2018-0110050, 2018.09)
24	Patent		Method and Apparatus for Experimental Design Optimization and Hypothesis Generation Using Generative Model (Patent application, 10-2018-0116750, 2018.10)
25	Patent	Rhee, June-Koo	Effective Quantum RAM Architecture for Quantum Database (Patent application, 10-2018-0056581, 2018.05)

Saudi Aramco-KAIST CO₂ Management Center

• Research Area(CO₂ conversion)

	Paper/Patent	Chief Researcher	Representative Research Achievements
1	Paper	lung Hostop	Z-scheme Photocatalytic CO ₂ Conversion on Three-Dimensional BiVO ₄ /Carbon-Coated Cu ₂ O Nanowire Arrays under Visible Light (ACS Catalysis, 2018.04)
2	Paper	Jung, Heetae	Highly Efficient and Stable CO ₂ Reduction Photocatalyst with a Hierarchical Structure of Mesoporous TiO_2 on 3D Graphene with Few-Layered MoS ₂ (ACS Sustainable Chemistry & Engineering, 2018.04)
3	Paper	Jung, WooChul	Study of the surface reaction kinetics of (La,Sr)MnO ₃ ^{-d} oxygen carriers for solar thermochemical fuel production (Journal of Materials Chemistry A, 2018.07)
4	Paper	Kim, Hyunwoo	Stereocontrolled, Divergent, Al(III)-Catalyzed Coupling of Chiral N-Aryl Epoxy Amines and CO_2 (Organic Letters, 2018.08)
5	Paper	Loo Dob Chang	Cu^+ -incorporated TiO ₂ overlayer on Cu_2O nanowire photocathodes for enhanced photoelectrochemical conversion of CO_2 to methanol (Journal of Energy Chemistry, 2018.01)
6	Paper	Lee, Doil Cliding	Selectivity of photoelectrochemical CO_2 reduction modulated with electron transfer from size-tunable quantized energy states of CdSe nanocrystals (Applied Surface Science, 2018.01)
7	Paper	Lee, Jay H.	Sustainability analysis of CO_2 capture and utilization processes using a computer-aided tool (Journal of CO_2 utilization, 2018.04)

	Paper/Patent	Chief Researcher	
8	Paper	Shin, Byungha	Effects of tempera (Journal of Materi
9	Paper	Song, Hyunjoon	Metal-CdSe Doub (Topics in Catalysi
10	Paper	Song, Hyunjoon	Composition effec (Journal of Materi
11	Patent	Lee, Jay H.	Larih process for p (Patent application
12	Patent	Song, Hyunjoon	Reduction method (Patent registratio

• Research Area(CO₂ capture)

	Paper/Patent	Chief Researcher	
1	Paper	Kim, Jihan	User-Friendly Gra (Korean Journal (

• Research Area(CO₂ avoidance using efficiency improvement)

	Paper/Patent	Chief Researcher	
1	Patent	Lee, Jeong Ik	OXY-FUEL COMBL (Patent application

• Research Area(CO₂ storage)

	Paper/Patent	Chief Researcher	
1	Paper	Lee, H.K.	Evolution of the b (Cement and Cone
2	Paper	Lee, H.K.	Unlocking the role (Inorganic Chemis
3	Paper	Lee, H.K.	CO ₂ uptake of carl (Materials, 2018.1

KAIST Institute Overview Research Highlights Research Achievements Faculty Information

Saudi Aramco-KAIST CO₂ Management Center

Representative Research Achievements

rature and coating speed on the morphology of solution-sheared halide perovskite thin-film rrials Chemistry A, 2018.11)

ble Shell Hollow Nanocubes via Sequential Nanoscale Reactions and Their Photocatalytic Hydrogen Evolution sis, 2018.05)

ect of alloy semiconductors on Pt-tipped $Zn_{1,x}Cd_x$ Se nanorods for enhanced photocatalytic hydrogen generation rials Chemistry A, 2018.08)

producing acetic acid by dry reforming reaction using carbon dioxide and system therefor on, PCT/KR2018/005074, 2018.05)

od of carbon dioxide using zinc based catalyst particle having core-shell structure and apparatus therefor ion, 10-1885321-0000, 2018.07)

Representative Research Achievements

raphics User Interface Software for Ideal Adsorbed Solution Theory Calculations I of Chemical Engineering, 2018.01)

Representative Research Achievements

BUSTION POWER GENERATION SYSTEM on, 10-2018-0112006, 2018. 09)

Representative Research Achievements

binder gel in carbonation-cured Portland cement in an acidic medium ncrete Research, 2018.07)

le of MgO in carbonation of alkali-activated slag cements istry Frontiers, 2018.07)

arbonation-cured cement blended with ground volcanic ash .11)

2018 KI NEWS

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KIB

Prof. Sun Chang Kim, awarded Grand Prize for Outstanding Contribution at KAIST Faculty Awards 2018

Prof. Sun Chang Kim was awarded Grand Prize for Outstanding Contribution at KAIST Faculty Awards 2018 for his contributions to the development of KAIST in commemoration of the 47th anniversary of founding.



KIR/KIAI

Prof. Myung Hyun, won Korean Prime Minister's Citation Prize for Science at 2018 National Science Day

Prof. Myung Hyun won Korean Prime Minister's Citation Prize for his achievements of research and development in science technology at 2018 National Science Day held in National Science Museum of Korea, Daejeon.





KIITC

Research Prof. Ho Jong Chang was awarded Best

Paper Award for 'A Study on the Measurement

of Aptamer in Urine Using SiPM' at ISIITA(The

International Symposium on Innovation in

ISHTA 2018

KIR/KIAI

Prof. Myung Hyun's research team,

awarded ISR Best Paper Award at

Prof. Myung Hyun's research team was awarded

ISR(Intelligent Service Robotics) Journal Best Paper

Award at Ubiquitous Robots(UR) 2018, Honolulu,

UR 2018

Hawaii.

Information Technology Application) 2018.

Research Prof. Ho Jong Chang,

awarded Best Paper Award at

ISIITA 2018

Prof. Hyunjoo Lee, awarded Young Catalysis Scholar Prize of KIChE Catalysis Division

CO₂

Prof. Hyunjoo Lee was awarded Young Catalysis Scholar Prize of KIChE(The Korean Institute of Chemical Engineers) Catalysis Division. The award is presented to a scientist who has contributed to the development of catalysis in Korea.

KIHST

Prof. Young Geun Park, awarded at the 9th Yumin Awards

Prof. Young Geun Park was awarded at the 9th Yumin Awards in the field of science. This award was given for his achievement of developing 3D holographic microscope which enables noninvasive examination of live cells and tissue samples.

Prof. Jeong Ik Lee, awarded Best Paper Award at Korean Nuclear Society

Prof. Jeong Ik Lee was awarded Best Paper Award at Korean Nuclear Society for his NET(Nuclear Engineering and Technology) article, which has been cited frequently in the field of CO₂ study at Science Citation Index(SCI).

KIHST

Prof. Wang Yuhl Oh, awarded at University-Industry Collaboration EXPO 2018

Prof. Wang Yuhl Oh was awarded at University-Industry Collaboration EXPO 2018 as the National Merit Honors for his contribution in the collaboration between university and industry through the development of OCT(Optical Coherence Tomography) technology and its transfer to industry.

KIB/FIRIC

Prof. Sang Yup Lee, received 2018 George Washington Carver Award

Prof. Sang Yup Lee received 2018 George Washington Carver Award for his innovations in industrial biotechnology. The annual Carver award recognizes an individual who has made a significant contribution to create environmentally sustainable products by applying industrial biotechnology.



KIITC

KI-ITC Augmented Reality Research Center

KI for IT Convergence set up Augmented Reality Research Center under its umbrella to conduct convergence research on information & communication and augmented reality technology for expanding human cababilities and improving the quality of human life.



KIB/FIRIC

Prof. Sang Yup Lee, awarded at 2018 Eni Awards

Prof. Sang Yup Lee was given the award for Advanced Environmental Solutions Prize at 2018 Eni Awards in recognition of his innovations to developing environmentally friendly production of chemicals, fuels, and materials. The Eni Award is referred to as the Nobel Award in the fields of energy and environment.



KINC

The 8th KINC Fusion Research Award

KI for the NanoCentury held The 8th KINC Fusion Research Award to encourage professors for convergence research and inspire research will to researchers and graduate students. Award of excellence was given to the best convergence research team.

KIR

Prof. Dong Soo Kwon, won Korean Presidential Citation at the 13th Korea Robot Awards

Prof. Dong Soo Kwon won Korean Presidential Citation at the 13th Korea Robot Awards for "K-FLEX", which is the first soft surgical robot developed in Korea. His winning at Best Application Award and Overall Winner in Surgical Robot Challenge of Hamlyn Symposium 2018 is also renowned for the status of Korea in the field of robotics.



KIB

Sweden-Korea Joint Symposium on Brain Research and Structural Biology

KI for the BioCentury invited experts in brain research and structural biology from KTH-Havard Medical School-Karolinska Institute, etc., and shared research trends and achievements of polymer structure biology on Sweden-Korea Joint Symposium on Brain Research and Structural Biology.





2018 KI NEWS

KIHST

KIHST Fourth Industrial Innovation Fusion Research Symposium

KI for Health Science and Technology held Fourth Industrial Innovation Fusion Research Symposium to find collaborative research projects on neuroimaing&neuromodulation, biophotonics and therapeutic bioengineering and to discuss its development.



FIRIC

Hosting a Special Session at 2018 Korea Science and Technology Annual Meeting

Fourth Industrial Revolution Intelligence Center hosted a special session on exploring core technologies of the fourth industrial revolution at 2018 Korea science and technology annual meeting.

The 27th AutoID Labs CJK Workshop

KI for IT Convergence held The 27th AutoID Labs CJK Workshop on standard technology and joint research among four asian contries(Korea, China, Japan and Taiwan).

KIAI

Taming AI: Engineering, Ethics and Policy Workshop

KI for Artificial Intelligence held Taming AI: Engineering, Ethics and Policy Workshop to share domestic and foreign research trends and to discuss future research directions on AI ethics.





Organizing Korea Session of WEF Annual Meeting of the New Champions

FIRIC

Fourth Industrial Revolution Intelligence Center organized Korea Session of WEF Annual Meeting of the New Champions to introduce successful innovation ecosystems of Korea and to discuss ways to adapt global trends on the fourth industrial revolution in the Korean context.



K

The 18th China-Japan-Korea Joint Workshop on Neurobiology and Neuroinformatics

KI for Artificial Intelligence held The 18th China-Japan-Korea Joint Workshop on Neurobiology and Neuroinformatics to present the latest research trends and outstanding research achievements in Korea, China, and Japan on deep learning with brain internal states.



KINC

International Workshop on Lithium Metal Batteries

KI for the NanoCentury held International Workshop on Lithium Metal Batteries to share the latest technical issues and research visions with experts on various topics in the field of lithium metal battery.





KIITC The 1st Daejeon-KAIST Workshop on Baryon Therapy Strategy and

Technology

KI for IT Convergence held The 1st Daejeon-KAIST Workshop on Baryon Therapy Strategy and Technology to share information on baryon therapy strategy and technology and to discuss cooperation with Daejeon City.

KIHST

2018 KAIST-KU Joint Symposium

KI for Health Science and Technology held 2018 KAIST-KU Joint Symposium to share the latest research trends and achievements related to basic science, clinical translational research and development of new convergence technologies on biophotonics and to discuss research collaboration with Kumamoto University, Japan.



KIB

The 1st Asian Synthetic Biology Symposium

KI for the BioCentury held The 1st Asian Synthetic Biology Symposium in Jeju to present the latest research trends and outstanding research achievements and to discuss fusion research for development of new framework in the field of synthetic biology.

KIR

Italy-Korea Bilateral Symopsium on Medical Robotics

KI for Robotics held Italy-Korea Bilateral Symopsium on Medical Robotics and invited renowned speakers in the field of medical robotics from Italy and Korea.



KAIST Institute Awards

in 2018 KAIST Institute selected and awarded of

excellent professors and researchers who created distinguished fusion research achievements and contributed to the development of KAIST Institute.





KAIST Institute for the BioCentury

• Research Area(Human Microbiome Control)

Name	Education	Research Interests	Website	Note
Kim, Sun Chang Dept. of Biological Sciences, Professor	Univ. of Wisconsin, Food Microbiology, Molecular Genetics, Ph.D. 1985	Synthetic Biology, Genome Engineering, Antimicrobial Peptides(AMPs)	http://bs.kaist.ac.kr/~mbtlab/	Director
Cho, Byung-Kwan Dept. of Biological Sciences, Associate Professor	Seoul Nat'l Univ., Biochemical Engineering and Biotechnology, Ph.D. 2003	Synthetic Biology, Genome and Transcriptome Engineering, Electrobiosynthesis	http://cholab.or.kr/	
Jeong, Ki Jun Dept. of Chemical and Biomolecular Engineering, Associate Professor	KAIST, Chemical and Biomolecular Engineering, Ph.D. 2001	Protein Engineering, Antibody Engineering, Protein Display and HTS	http://proteineng.kaist.ac.kr	
Kim, Joon Graduate School of Medical Science and Engineering, Associate Professor	Univ. of California at Irvine, Anatomy and Neurobiology, Ph.D. 2006	Molecular Genetics, Cell Biology, Neuroembryology	https://sites.google.com/a/kaist. edu/biochem-molbiol-lab/	
Kim, Hail Graduate School of Medical Science and Engineering, Associate Professor	Yonsei Univ., Biochemistry and Molecular Biology, M.D./Ph.D. 2002	Diabetology, Beta Cell Biology, Serotonin Biology	http://mdrl.kaist.ac.kr/	
Lee, Sang Yup Dept. of Chemical and Biomolecular Engineering, Professor	Northwestern Univ., Chemical Engineering, Ph.D. 1991	Metabolic Engineering, Biochemical Engineering, DNA chip	http://mbel.kaist.ac.kr/	
Park, Hee Sung Dept. of Chemistry, Associate Professor	KAIST, Chemical Engineering, Ph.D. 2000	Biochemistry, Chemical Biology	https://sites.google.com/site/ hsparkmsbl/	
Park, Hyun Gyu Dept. of Chemical and Biomolecular Engineering, Professor	KAIST, Chemical Engineering, Ph.D. 1996	Nucleic Acid Bioengineering, Biochips & Biosensor, Electrochemical Diagnosis	http://bcbd.kaist.ac.kr	
Cho, Suhyung KI for the BioCentury, Research Professor	Seoul Nat'l Univ., Biochemical Engineering and Biotechnology, Ph.D. 2005	Transcription Processing, Regulation, RNA Synthetic Biology, Regulatory Genomics	https://kis.kaist.ac.kr/index. php?mid=KIB_O#	
Lee, Jun Hyoung KI for the BioCentury, Research Professor	KAIST, Molecular Biotechnology, Ph.D. 2010	Synthetic Biology	https://kis.kaist.ac.kr/index. php?mid=KIB_O#	

• Research Area(Cancer Metastasis Control)

	Education	Research Interests	Website	Remark
Han, Yong Man Dept. of Biological Sciences, Professor	KAIST, Molecular Biology, Ph.D. 1993	Differentiation of Embryonic Stem Cells, Induced Pluripotent Stem Cells	http://stemcell.kaist.ac.kr/	
Heo, Won Do Dept. of Biological Sciences, Professor	Gyeongsang Nat'l Univ., Biochemistry, Ph.D. 1999	Bio-Imaging, Cell Signaling, Neuroscience	https://sites.google.com/site/ heolab/	
Jeong, Won-il Graduate School of Medical Science and Engineering, Associate Professor	Kyungpook Nat'l Univ., College of Veterinary Medicine, D.V.M./Ph.D. 2004	Pathology, Cell Engineering	http://web.kaist.ac.kr/~llr/	
Jon, Sangyong Dept. of Biological Sciences, Professor	KAIST, Chemistry, Ph.D. 1999	Targeted Therapy, Drug Delivery System, Nanoparticle Based Vaccine	http://www.bionanolab.co.kr/	

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Name	Education	Research Interests	Website	Remark
im, Ho Min iraduate School of Medical Science nd Engineering, ssociate Professor	KAIST, Biological Sciences, Ph.D. 2005	Molecular Structure Biology, X-ray Crystallography, Electron Microscope	http://gsmse.kaist.ac.kr	
im, Jaehoon lept. of Biological Sciences, ssistant Professor	Rockefeller Univ., Biochemistry and Molecular Biology, Ph.D. 2007	Biochemistry, Molecular Biology	http://molneuro.kaist.ac.kr/ contents/	
im, Mi Young lept. of Biological Sciences, ssociate Professor	Cornell Univ., Molecular Biology and Genetics, Ph.D. 2004	Metastasis, Epigenetics, Stem Cell	https://sites.google.com/site/ bglabkorea/	
c im, Seyun Jept. of Biological Sciences, ssociate Professor	Johns Hopkins Univ. of Medicine, Dept. of Biological Chemistry, Ph.D. 2007	Metabolism Signaling Network	http://pbil.kaist.ac.kr	
ee, Daeyoup lept. of Biological Sciences, rofessor	KAIST, Biological Sciences, Ph.D. 1999	Chromatin Biology	https://sites.google.com/site/ kaistchromatin/	
ee, Gyun Min Jept. of Biological Sciences, rofessor	Univ. of Michigan, Chemical Engineering, Ph.D. 1990	Cell Engineering, Proteomics, Cell Therapy	http://bs.kaist.ac.kr/~acelab/	
ee, Hyotcherl lept. of Chemistry, rofessor	California Institute of Technology, Chemistry, Ph.D. 2001	Molecular Structural Dynamics, Chemical Reaction Dynamics, Protein Structural Dynamics	http://time.kaist.ac.kr/	
ee, Jie Oh Jept. of Chemistry, rofessor	Harvard Univ., Biochemistry, Ph.D. 1995	Structural Immunochemistry	http://cafe.naver.com/advbio.cafe	
Ph, Byung-Ha lept. of Biological Sciences, rofessor	Univ. of Wisconsin-Madison, Biophysics, Ph.D. 1989	Chronosome Codensation, Infection and Immunity	http://struct.kaist.ac.kr/	
ong, Ji-Joon rept. of Biological Sciences, Associate Professor	Watson School of Biological Sciences, Cold Spring Harbor Laboratory, Structural Biology, Ph.D. 2005	Histone Methyltransferases, Chromatin Assembly, Nucleosome Recognition, Neurodegenerative Disease	https://sites.google.com/site/ songkaist/	
ho, Carol AIST Institute for the BioCentury, esearch Professor	Univ. of California, San Francisco, Biochemistry, Ph.D. 2011	Biochemistry, Biological Sciences	https://kis.kaist.ac.kr/index. php?mid=KIB_O#	

• Research Area(Brain Cognitive Function Control)

Name	Education	Research Interests	Website	Remark
Choi, Jung Kyoon Dept. of Bio and Brain Engineering, Associate Professor	KAIST, Biology, Ph.D. 2004	Omics, Genome/Epigenome Engineering	http://omics.kaist.ac.kr	
Han, Jin-Hee Dept. of Biological Sciences, Associate Professor	Seoul Nat'l Univ., Neurosciece, Ph.D. 2004	Neurobiology, Neural Circuit, Synaptic Physiology, Animal Behavior	https://sites.google.com/site/ neuralcircuitandbehaviorlab/	
Jung, Min Whan Dept. of Biological Sciences, Professor	Univ. of California, Irvine, Psychobiology, Ph.D. 1990	Decision Making, Episodic Memory, Interval Timing	https://sites.google.com/site/ systemsneurolaboratory/	
Kim, Daesoo Dept. of Biological Sciences, Professor	POSTECH, Life Science, Ph.D. 1998	Behavioral Neuroscience, Movement Disorders	https://sites.google.com/site/ mcikaist/	

Research Highlights

Research Achievements

Faculty Information

KAIST Institute for the BioCentury

KAIST Institute for the BioCentury

	Education	Research Interests	Website	Remark
Kim, Eunjoon Dept. of Biological Sciences, Professor	Michigan State Univ., Pharmacology and Toxicology, Ph.D. 1994	Neuroscience, Molecule Neuroscience	https://sites.google.com/site/ seyunkimlab/	
Kim, Jin Woo Dept. of Biological Sciences, Associate Professor	KAIST, Biological Sciences, Ph.D. 1999	Developmental Neurobiology, Neuro-regeneration, Retinal Degeneration	https://sites.google.com/site/kaist- jhkim/	
Lee, Seung-Hee Dept. of Biological Sciences, Associate Professor	Seoul Nat'l Univ., School of Biological Sciences, Ph.D. 2007	Neurobiology, Neurophysiology, Neuromodulatory Systems	https://sites.google.com/site/ leelab2013/	
Park, Chankyu Dept. of Biological Sciences, Professor	Washington State Univ., Microbiology, Ph.D. 1985	Molecular Physiology	https://sites.google.com/site/ck- parkhome/	
Chae, Sujin KI for the BioCentury, Research Professor	Seoul Nat'l Univ., Biomedical Biochemistry, Ph.D. 2009	Behavioral Epigenetics	https://kis.kaist.ac.kr/index. php?mid=KIB_O#	

KAIST Institute for IT Convergence

• Research Area(Integrated sensors)

	Education	Research Interests	Website	Remark
Cho, Gyuseong Dept. of Nuclear & Quamtum Engineering, Professor	Univ. of Califorinia Berkeley, Nuclear Engineering, Ph.D. 1992	Radiation image sensor, Medical diagnosis equipment, Radiation detector	https://radiation.kaist.ac.kr	Director
Cho, Seungryong Dept. of Nuclear & Quantum Engineering, Associate Professor	The Univ. of Chicago, Medical Physics, Ph.D. 2009	Medical imaging, Radiation therapy	http://mirlab.kaist.ac.kr/	
Hong, Songcheol School of Electrical Engineering, Professor	Univ. of Michigan, Electrical Engineering, Ph.D. 1989	Integrated High frequency sensor, 5G communication	http://weis.kaist.ac.kr	
Park, Chong-Ook Dept. of Materials Science Engineering, Professor	Ohio State Univ., Materials Science, Ph.D. 1985	Chemical sensors	http://mse.kaist.ac.kr/~copark	
Won, Yong Hyub School of Electrical Engineering, Professor	Cornell Univ., Electrical Engineering, Ph.D. 1990	Advanced Sensors and Optical Network	http://code.kaist.ac.kr	
Chang, Ho-Jong KI-ITC, Research Assistant Professor	Chungnam Nat'l Univ., Electronics Engineering, Ph.D. 2014	Medical Device Biosignal Measurement	http://itc.kaist.ac.kr	

• Research Area(B5G/6G mobile communications and wireless power transfer technology)

	Education	Research Interests	Website	Remark
Cho, Dong Ho School of Electrical Engineering, Professor	KAIST, Electrical Engineering, Ph.D. 1985	5G mobile communication, Wireless power transfer, System biology	http://umls.kaist.ac.kr/	
Lee, Yong-Hoon School of Electrical Engineering, Professor	Univ. of Pennsylvania, Electrical Engineering, Ph.D. 1984	Communication Signal Processing	http://kalman.kaist.ac.kr	

	Education	Research Interests	Website	Remark
Yu, Jong-Won School of Electrical Engineering, Professor	KAIST, Electrical Engineering, Ph.D. 1998	RF Microelectronics, RF and Microwave System Integration	http://rfss.kaist.ac.kr	
Lee, Ju Yong KI-ITC, Research Associate Professor	KAIST, Electrical Engineering, Ph.D. 2003	5-th Generation Wireless Communication	http://itc.kaist.ac.kr	
Gil, Gye-Tae KI-ITC, Research Associate Professor	KAIST, Electrical Engineering, Ph.D. 2004	Communication signal processing, Advanced Multi-user MIMO technology, Adaptive filter design	http://itc.kaist.ac.kr	

• Research Area(IoT/WoT)

Education	Research Interests		Remark
- CAIST, Electrical Engineering, Ph.D. 1988	Energy-saving network, Internet of Things, Knowledge engineering	http://mnlab.kaist.ac.kr	
Max-Planck-Institute for Brain Research, 3rain Systems Research, ²h.D. 1994	Systems neuro science, Neuro robotics, Brain decodes	http://brain.kaist.ac.kr	
Jniv. of Florida, Computer Engineering, Ph.D. 2001	Realtime and Embedded Systems, Internet of Things	http://www.resl.kaist.ac.kr/	
Jniv. of Southern California, Computer Science, Ph.D. 2002	Network and Distributed System Security, Applied Cryptography	http://syssec.kaist.ac.kr/~yongdaek/	
llinois Institute of Technology, Design, Ph.D. 2003	Human-Computer Interaction, Ubiquitous Computing, Experience-centered Design	http://cixd.kaist.ac.kr/	
Jniv. of Southern California, :E-systems, Ph.D. 1998	3D Vision, Context-aware Interaction, Augmented Human	http://uvrlab.org/	
	AIST, lectrical Engineering, h.D. 1988 Aax-Planck-Institute for Brain Research, irain Systems Research, h.D. 1994 Jniv. of Florida, iomputer Engineering, h.D. 2001 Jniv. of Southern California, iomputer Science, h.D. 2002 llinois Institute of Technology, besign, h.D. 2003 Jniv. of Southern California, iE-systems, h.D. 1998	AlST, lectrical Engineering, h.D. 1988Energy-saving network, Internet of Things, Knowledge engineeringAax-Planck-Institute for Brain Research, train Systems Research, h.D. 1994Systems neuro science, Neuro robotics, Brain decodesIniv. of Florida, computer Engineering, h.D. 2001Realtime and Embedded Systems, Internet of ThingsJniv. of Southern California, computer Science, h.D. 2002Network and Distributed System Security, Applied CryptographyIlinois Institute of Technology, besign, th.D. 2003Human-Computer Interaction, Ubiquitous Computing, Experience-centered DesignJniv. of Southern California, th.D. 19983D Vision, Context-aware Interaction, Augmented Human	AlsT, lectrical Engineering, h.D. 1988Energy-saving network, Internet of Things, Knowledge engineeringhttp://mnlab.kaist.ac.krAax-Planck-Institute for Brain Research, train Systems Research, h.D. 1994Systems neuro science, Neuro robotics, Brain decodeshttp://brain.kaist.ac.krIniv. of Florida, computer Engineering, h.D. 2001Realtime and Embedded Systems, Internet of Thingshttp://www.resl.kaist.ac.kr/Iniv. of Southern California, computer Science, h.D. 2002Network and Distributed System Security, Applied Cryptographyhttp://syssec.kaist.ac.kr/Iniois Institute of Technology, besign, th.D. 2003Human-Computer Interaction, Ubiquitous Computing, Experience-centered Designhttp://uvrlab.org/Iniv. of Southern California, context-aware Interaction, Augmented Human3D Vision, Context-aware Interaction, Augmented Humanhttp://uvrlab.org/

• Research Area(RTOS for Humanoid Robots)

	Education	Research Interests		Remark
Oh, Jun Ho Dept. of Mechanical Engineering, Professor	Univ. of California, Berkeley, Mechanical Engineering, Ph.D. 1985	Control System for Humanoid, Telescope Mount System, Sensor & Measurement	http://hubolab.kaist.ac.kr	Director

• Research Area(Mobile Intelligence)

Name	Education	Research Interests	Website	Remark
Chang, Naehyuck School of Electrical Engineering, Professor	Seoul Nat'l Univ., Electrical Engineering, Ph.D. 1996	Low-power and low-energy design, Operation of electric vehicles	http://www.cad4x.kaist.ac.kr	

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Research Highlights

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KAIST Institute for Robotics

Name	Education	Research Interests	Website	Remark
Kim, A Young Civil & Environmental Engineering, Assistant Professor	Univ. of Michigan, Mechanical Engineering, Ph.D. 2012	SLAM, navigation, perception	http://irap.kaist.ac.kr	
Kim, Jin Whan Dept. of Mechanical Engineering, Associate Professor	Stanford Univ., Aeronautics and Astronautics (with Ph.D. minor in Electrical Engineering), Ph.D. 2007	Vehicle intelligence, Vehicle dynamics, control Marine robotics	http://morin.kaist.ac.kr	
Kim, Jun Mo Electrical Engineering, Associate Professor	Massachusetts Institute of Technology, Electrical Engineering, Ph.D. 2005	Machine learning, Deep learning, Computer vision	http://siit.kaist.ac.kr	
Myung, Hyun School of Electrical Engineering, Professor	KAIST, Electrical Engineering, Ph.D. 1998	Robot navigation, Artificial intelligence, Inspection robot	http://urobot.kaist.ac.kr	
Shim, Hyun chul School of Electrical Engineering, Associate Professor	Univ. of California, Berkeley, Mechanical Engineering, Ph.D. 2000	robotics, unmanned system	http://unmanned.kaist.ac.kr	

• Research Area(Al for Cooperative Robots)

Name	Education	Research Interests	Website	Remark
Choi, Han-Lim Dept. of Aerospace Engineering, Associate Professor	Massachusetts Institute of Technology, Aeronautics and Astronautics, Ph.D. 2009	Navigation and planning of autonomous robots, Air and space vehicle guidance and control	http://lics.kaist.ac.kr	
Jo, Sung Ho School of Computing, Associate Professor	Massachusetts Institute of Technology, Electrical Engineering & Computer Science, Ph.D. 2006	Intelligent robot, Neuro computing	http://isnl.kaist.ac.kr	
Kim, Jong-Hwan School of Electrical Engineering, Professor	Seoul Nat'l Univ., Electrical Engineering, Ph.D. 1987	Intelligence Super Agent, Intelligent Interactive Technology	http://rit.kaist.ac.kr	
Kwon, Dong-Soo Dept. of Mechanical Engineering, Professor	Georgia Institute of Technology, Mechanical Engineering, Ph.D. 1991	Human-Robot Interaction, Haptics, Medical Robotics	http://robot.kaist.ac.kr	

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• Research Area(NT for Climate Change)

	Education	Research Interests	Website	Remark
Jung, Hee Tae Dept. of Chemical & Biomolecular Engineering, Professor	Case Western Reserve Univ., Macromolecular Science & Engineering, Ph.D. 1998	Molecular Self-Assembly, Soft-building blocks, Organic Opto-electronic Devices: Display, Energy Devices & Sensor	http://ooem.kaist.ac.kr	Director
Byon, Hye Ryung Dept. of Chemistry, Associate Professor	POSTECH, Chemistry, Ph.D. 2008	Li-O2 Batteries, Li-S Batteries, Redox Flow Batteries	http://www.emdl.kaist.ac.kr/	
Cafer T. Yavuz Graduate School of EEWS, Associate Professor	Rice Univ., Chemistry, Ph.D. 2001	Understanding and Manipulating Nanoscale Chemistry at Confined Spaces	http://yavuz.kaist.ac.kr/	
Cho, EunAe Dept. of Materials Science and Engineering, Associate Professor	KAIST, Materials Science and Engineering, Ph.D. 2002	Fuel Cell, Battery, Electrolysis	http://ecsm.kaist.ac.kr	

Name	Educati
Cho, Eun Seon Dept. of Chemical & Biomolecular Engineering, Assistant Professor	MIT, Chemical and Biomolecular I Ph.D. 2013
Choi, Minkee Dept. of Chemical and Biomolecular Engineering, Associate Professor	KAIST, Chemistry, Ph.D. 2007
Choi, Siyoung Dept. of Chemical & Biomolecular Engineering, Associate Professor	UCSB, Chemical Engineering, Ph.D. 2011
Chung, Sung-Yoon Graduate School of EEWS, Associate Professor	KAIST, Materials Science & Enginee Ph.D. 2001
Han, Myung Joon Dept. of Physics, Professor	Seoul Nat'l Univ., Physics, Ph.D. 2007
Han, Sang Woo Dept. of Chemistry, Professor	Seoul Nat'l Univ., Chemistry, Ph.D. 2000
Han, Seung Min Jane Graduate School of EEWS, Associate Professor	Stanford Univ., Materials Science and Engine Ph.D. 2006
Hong, Soon Hyung Dept. of Materials Science and Engineering, Professor	Northwestern Univ., Materials Science & Enginee Ph.D. 1984
Jang, Dong Chan Dept. of Nuclear and Quantum Engineering, Associate Professor	Univ. of Michigan, Materials Science & Enginee Ph.D. 2006
Jeon, Seokwoo Dept. of Materials Science and Engineering, Professor	Univ. of Illiniois, Materials Science & Enginee Ph.D. 2006
Jung, WooChul Dept. of Materials Science and Engineering, Associate Professor	MIT, Materials Science & Enginee Ph.D. 2010
Jung, Yousung Graduate School of EEWS, Professor	UC Berkeley, Chemistry, Ph.D. 2005
Kang, Jeung Ku Graduate School of EEWS, Professor	Stanford Univ., Materials Science and Engine Ph.D. 2002
Kim, Bumjoon Dept. of Chemical and Biomolecular Engineering, Professor	Univ. of California, Chemical Engineering, Ph.D. 2006
Kim, Do Kyung Dept. of Materials Science and Engineering, Professor	KAIST, Materials Science & Enginee Ph.D. 1987
Kim, Hee-Tak Dept. of Chemical and Biomolecular	KAIST, Chemical Engineering,

Research Highlights Research Achievements

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ucation	Research Interests		Remark
cular Engineering,	Design and Synthesis of Functional Hybrid Nanomaterials(Inorganic Nanocrystals, Carbon Materials, Polymer)	https://fhnl.kaist.ac.kr	
	Nanotechnology for Energy & Environment, Catalyst Design by Nanotechnology, Lignocellulose-Based Energy and Chemical Source	http://egcl.kaist.ac.kr	
	Transport Science(Rheology and Mass Transfer), Fluids in Porous Media, Lipid Bilayers Membranes	https://mpcomplexfluids. wordpress.com/	
gineering,	Materials Physics and Defects Chemistry for Energy Storage and Conversion, Atomic-Level Visualization with TEM/STEM, In-Situ Observation of Phase Transitions & Evolution	https://sites.google.com/site/ atomicscaledefects/	
	Condensed Matter Theory	https://sites.google.com/site/ myungjoonhan	
	Noble Metal Nanocrystals and Their Designed Assembly	http://ntl.kaist.ac.kr	
ngineering,	Mechanical Properties of Nano-Structured Energy Materials	http://mpnano.kaist.ac.kr	
gineering,	Design, Processes & Properties of Composite Materials	http://composite.kaist.ac.kr	
gineering,	Nanomechanics and Radiation Materials Science	http://sth528.wix.com/ nanomechalab	
gineering,	Flexible Nanoelectronics, Advanced Photonic Materials	http://fdml.kaist.ac.kr	
gineering,	Solar Fuels, Fuel Cells, Electro-catalysis	http://seml.kaist.ac.kr	
	Advanced Materials High-Throughput Computational Design	http://qchem.kaist.ac.kr	
ngineering,	Artificial Photosynthesis for Regeneration of Sustainable Fuel from CO ₂ and H ₂ O, Energy Storage, New Multiscale Simulation Method	http://nanosf.kaist.ac.kr	
	Organic Solar Cells, Polymer/Inorganic Hybrid Materials, Polymer Nanomaterials	http://pnel.kaist.ac.kr	
gineering,	Nano Ceramics for Energy and Structural Applications	http://mse2.kaist.ac.kr/~ncrl/	
	Fuel Cells, Lithium Batteries & Redox Flow Batteries, Nano Fabrications	http://eed.kaist.ac.kr/	

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• Research Area(NT for Healthcare)

	Education	Research Interests		Remark
Chung, Hyun Jung Graduate School of Nanoscience and Technology, Assistant Professor	KAIST, Bioengineering, Ph.D. 2010	Nanobiomedicine	https://sites.google.com/site/ nanobiomedlab/	
Daniel Seungbum Hong Dept. of Materials Science & Engineering, Associate Professor	KAIST, Materials Science and Engineering, Ph.D. 2000	Domain and Domain Wall Engineering Using Advanced Scanning Probe Microscopies, Visualization of Polarization Domains and Ionic Charges at Solid/Liquid Interfaces, Mechanism of Resistivity Change in Oxide Materials	http://mii.kaist.ac.kr	
Je, Minkyu Dept. of Electrical Engineering, Associate Professor	KAIST, Electrical Engineering and Computer Science, Ph.D. 2003	Intelligent Sensor Interface, Ultra-Low-Power Wireless Communication, Microsystem Integration for Emerging Applications(IoT, Wearables, Medical Devices, and Brain Mapping)	http://impact.kaist.ac.kr	
Kim, Bongsoo Dept. of Chemistry, Professor	California Univ., Chemistry, Ph.D. 1990	Advanced Plasmonic Materials, Medical Nanobio Technology Employing Noble Metal Nanowire, Self-Assembled Monolayer(SAM) using 2-Dimensional Gold Nanostructure	http://nanowire.kaist.ac.kr	
Kim, Hak-Sung Dept. of Biological Sciences, Professor	Université de Technologie de Compiègne, Biochemical Engineering, Ph.D. 1985	Molecular Evolution, Biomolecular Recognition	http://bel.kaist.ac.kr	
Kim, II-Doo Dept. of Materials Science and Engineering, Associate Professor	KAIST, Materials Science & Engineering, Ph.D. 2002	Inorganic Nanomaterials for Energy and Nanoelectronics	http://advnano.kaist.ac.kr	
Kim, Pilnam Dept. of Bio and Brain Engineering, Associate Professor	Seoul Nat'l Univ., Mechanical Engineering, Ph.D. 2009	Space of the Dynamics of Organism Architectures and Biological Patterns	http://pilnam.kaist.ac.kr	
Kim, Yeu-Chun Dept. of Chemical & Biomolecular Engineering, Associate Professor	Georgia Institute of Technology, Chemical and Biomolecular Engineering, Ph.D. 2007	Drug and Vaccine Delivery, Cell-penetrating Peptide, Cancer Therapy	http://bmnd.kaist.ac.kr/	
Kim, Yong Woon Graduate School of Nanoscience and Technology, Associate Professor	POSTECH, Physics, Ph.D. 2002	Theoretical Biophysics, Soft Matter Theory, Nonequilibrium Phenomena	-	
Kim, Yong-Hyun Graduate School of Nanoscience and Technology, Professor	KAIST, Physics, Ph.D. 2003	Quantum Nano-bio Materials Science/simulation, First-principles Electronic Structure and Molecular Dynamics Calculations for Nano-bio and Energy Materials	http://qnmsg.kaist.ac.kr	
Lee, Haeshin Dept. of Chemistry, Professor	Northwestern Univ., Biomedical Engineering, Ph.D. 2008	Generalized Strategy for Functionalization of any Material Surfaces Inspired by Mussel Adhesion Adhesive Anti-bacterial, Anti-fungal Compounds Nanoparticle Synthesis Protein Therapeutics Development of Synthetic Gecko Adhesives Biointerphases	http://sticky.kaist.ac.kr	
Lee, Hyun Joo Dept. of Chemical & Biomolecular Engineering, Assistant Professor	Stanford Univ., Electrical Engineering, Ph.D. 2012	Neurotransmitter sensing, Development of neuroscience tools, Brain stimula, Epidermal sensors	http://bmm.kaist.ac.kr	
Lee, Sang Yup Dept. of Chemical & Biomolecular Engineering, Professor	Northwestern Univ., Chemical Engineering, Ph.D. 1991	Metabolic Engineering, Systems Biotechnology, Synthetic Biology	http://mbel.kaist.ac.kr/	
Lee, Wonhee Graduate School of Nanoscience and Technology, Associate Professor	California Institute of Technology, Applied Physics, Ph.D. 2008	Development of Microfluidic calorimeters and applications for cell biology, High-throughput self-assembly of nano-, microparticles using inertial microfluidics	http://mfbsl.kaist.ac.kr/	
Nam, Yoon Sung Dept. of Materials Science & Engineering, Associate Professor	MIT, Biological Engineering, Ph.D. 2010	Peptide-based Nanomaterials, Nucleic acid-based Nanomaterials, Solar Fuel Cells	http://nabi.kaist.ac.kr/	

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Name	Education	Research Interests	Website	Remark
Kim, Ji Han Dept. of Chemical & Biomolecular Engineering, Associate Professor	Univ. of Illiniois, Electrical and Computer Engineering, Ph.D. 2009	Carbon Capture, Methane/Hydrogen Storage, Materials Genome Project	http://molsim.kaist.ac.kr/	
Kim, Yong-Hoon Graduate School of EEWS, Associate Professor	Univ. of Illiniois, Physics, Ph.D. 2000	Nanostructures, Nanosurfaces, Nanointerfaces	http://nanofun.kaist.ac.kr/yhklab	
Koh, Dong-Yeun Dept. of Chemical & Biomolecular Engineering, Assistant Professor	KAIST, Chemical & Biomolecular Engineering, Ph.D. 2013	Membrane Separations, Adsorptive Separations, Nanoporous Materials	https://mmml.kaist.ac.kr	
Lee, Doh Chang Dept. of Chemical & Biomolecular Engineering, Associate Professor	The Univ. of Texas at Austin, Chemical Engineering, Ph.D. 2007	Quantum Dots, Photocatalysis, QLED	http://dclee.kaist.ac.kr/	
Lee, Jae Woo Dept. of Chemical & Biomolecular Engineering, Professor	Carnegie Mellon Univ., Chemical Engineering, Ph.D. 2000	CO ₂ conversion to energy materials, Energy efficient designs, Clathrate hydrates	http://efdl.kaist.ac.kr	
Lee, Jay Hyung Dept. of Chemical & Biomolecular Engineering, Professor	California Institute of Technology, Chemical Engineering, Ph.D. 1991	Model Predictive Control, Approximate Dynamic Programming for Stochastic MDPs, Real-Time Optimization	http://lense.kaist.ac.kr	
Lee, JinWoo Dept. of Chemical & Biomolecular Engineering, Professor	Seoul Nat'l Univ., Chemical and Biological Engineering, Ph.D. 2003	Electrocatalysts for CO ₂ conversion and Fuel Cells, Rechargeable Battery, Inorganic-Organic Hybrid Materials	http://cens.kaist.ac.kr/	
Lee, Jung-Yong Graduate School of EEWS, Associate Professor	Stanford Univ., Electrical Engineering, Ph.D. 2009	Renewable Energy, Nanomaterials	http://adec.kaist.ac.kr	
Li Sheng Dept. of Chemical & Biomolecular Engineering, Assistant Professor	Princeton Univ., Chemical Engineering, Ph.D. 2013	Block Copolymer, Hybrid Polymer	https://bcpolymer.wordpress.com	
Oh, Ji Hun Graduate School of EEWS, Associate Professor	MIT, Materials Science & Engineering, Ph.D. 2010	Nanomaterials, Solar Energy Conversion	http://les.kaist.ac.kr	
Park, Inkyu Dept. of Mechanical Engineering, Associate Professor	California Univ., Mechanical Engineering, Ph.D. 2007	High Performance Bio/Chemical & Physical Sensors based on Functional Nanostructures, Micro/Nanomanufacturing Processes and Systems, Mechanics & Reliability of Micro/nanoscale Structures and Systems	http://mintlab1.kaist.ac.kr	
Park, Jeong Young Graduate School of EEWS, Professor	Seoul Nat'l Univ., Physics, Ph.D. 1999	Metal-semiconductor Nanodiode, Nanotribology, Mechanics, and Molecular Electronics with SPM, Fabrication and Characterization of Nanoscale Hybrid Systems	http://scale.kaist.ac.kr	
Ryu, Ho Jin Dept. of Nuclear and Quantum Engineering, Associate Professor	KAIST, Materials Science & Engineering, Ph.D. 2000	Nuclear Fuel Development, Fuel Cycle Materials Research	https://sites.google.com/site/ fuelcyclematerials	
Shin, Byungha Dept. of Materials Science & Engineering, Associate Professor	Harvard Univ., Applied Physics, Ph.D. 2007	Inorganic Thin Film Solar Cells, Organic-inorganic Hybrid Photovoltaic Materials, Electronic Materials	http://energymatlab.kaist.ac.kr	
Song, Hyunjoon Dept. of Chemistry, Professor	KAIST, Chemistry, Ph.D. 2000	Surface Plasmon Monitoring, Photoactive Energy Catalysts, Electroactive Materials	http://small.kaist.ac.kr	

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Name	Education	Research Interests	Website F	Remark
Nam, Yoonkey Dept. of Bio and Brain Engineering, Associate Professor	Univ. of Illiniois, Electrical Engineering, Ph.D. 2005	Neural Microsystems and Instrumentation, Neural Interfacing, Neuron-on-a-chip	http://neuros.kaist.ac.kr	
Park, Chan Beum Dept. of Materials Science & Engineering, Professor	POSTECH, Biochemical Engineering, Ph.D. 1999	Biomaterials for Energy and Medicine	http://biomaterials.kaist.ac.kr	
Park, Je-Kyun Dept. of Bio and Brain Engineering, Professor	KAIST, Biotechnology, Ph.D. 1992	Nanobiotechnology, Integrative Bioengineering, Microfluidics, Lab-on-a-chip	http://nanobio.kaist.ac.kr	
Park, Ji Ho Dept. of Bio and Brain Engineering, Associate Professor	California Univ., Materials Science, Ph.D. 2009	Biomaterials, Cancer Nanotechnology	http://openwetware.org/wiki/ Park_Lab	
Park, Steve Dept. of Materials Science and Engineering, Assistant Professor	Stanford Univ., Materials Science & Engineering, Ph.D. 2014	Nanoelectronics, Printed Organic Electronics, Stretchable Electronics and Sensors, Bioelectronics	http://steveparklab.kaist.ac.kr/	
Park, Su-Hyung Graduate School of Medical Science and Engineering, Assistant Professor	POSTECH, Biological Sciences, Ph.D. 2008	Infectious Disease, Viral Immunology, Vaccine		
Shin, Jennifer H. Dept. of Mechanical Engineering, Associate Professor	Massachusetts Institute of Technology Cambridge, Mechanical Engineering, Ph.D. 2004	Cell Mechanics, Cellular Mechanobiology, Microfluidics, Biological Locomotio	http://softbm.kaist.ac.kr	
Sohn, Jong-Woo Dept. of Biological Sciences, Assistant Professor	Seoul Nat'l Univ., College of Medicine, Physiology, Ph.D. 2008	Central Serotonin System, Autonomic Neuroscience	https://sites.google.com/site/ sohnlab2014/	
Yoon, Jun-Bo Dept. of Electrical Engineering, Professor	KAIST, Electrical Engineering, Ph.D. 1999	Nano/micro-switch for DC & RF applications, N/MEMS for Optical Components, Nano-sensor devices for future electronics	http://MEMS.kr	

• Research Area(NT for Advanced Opto-Electronics)

Name	Education	Research Interests	Website Re	emark
Bae, Byeong-Soo Dept. of Materials Science and Engineering, Professor	Univ. of Arizona, Materials Science & Engineering, Ph.D. 1993	Optical and Display Materials, Sol-Gel Technology	http://www.sol-gel.net/	
Cho, Byung Jin Dept. of Electrical Engineering, Professor	KAIST, Electrical Engineering, Ph.D. 1991	Nano IC Technology	https://need.kaist.ac.kr/	
Cho, Sungjae Dept. of Physics, Assistant Professor	Univ. of Maryland at College Park, Physics, Ph.D. 2011	Quantum Transport in Topological Materials, Quantum Phase Transitions in Thin Films, Spin Transport	http://qtak.kaist.ac.kr	
Cho, Yong-Hoon Dept. of Physics, Professor	Seoul Nat'l Univ., Physics, Ph.D. 1997	Semiconductor Physics	http://qnp.kaist.ac.kr	
Choi, Hyoung Soon Dept. of Physics, Associate Professor	Northwestern Univ., Physics, Ph.D. 2007	Experimental Condensed Matter Physics at Low Temperatures		
Choi, Sung-Min Dept. of Nuclear and Quantum Engineering, Professor	MIT, Nuclear Engineering, Ph.D. 1998	Neutron Scattering Studies of Nano-Materials, Superconductivity Nuclear Magnetic Resonance Imaging, Spectroscopy	http://egcl.kaist.ac.kr	
Choi, Sung-Yool Dept. of Electrical Engineering, Professor	KAIST, Chemistry, Ph.D. 1998	Graphene & 2D Materials and Applications, Flexible/Wearable/Soft Electronics	http://mndl.kaist.ac.kr	

Name	Education	Research Interests	Website	Remark
Im, Sung Gap Dept. of Chemical & Biomolecular Engineering, Associate Professor	MIT, Chemical Engineering, Ph.D. 2009	Chemical Vapor Deposition of Electrically Conducting Polymers and Functional Polymers, New Concept Organic Electronic Devices and Energy Devices: Flexible and Disposable, Microfluidic Device Fabrication by Applying Various Substrate Materials	http://ftfl.kaist.ac.kr	
Jang, Min Seok Dept. of Electrical Engineering, Assistant Professor	Caltech, Applied Physic, Ph.D. 2013	Nanophotonics, Plasmonics, Metamaterials, Electron optics	http://jlab.kaist.ac.kr	
Jeon, Duk Young Dept. of Materials Science and Engineering, Professor	Lehigh Univ., Physics, Ph.D. 1988	Semiconductor Physics, Display Materials	http://display.kaist.ac.kr	
J ung, Yeon Sik Dept. of Materials Science and Engineering, Associate Professor	MIT, Materials Science & Engineering, Ph.D. 2009	Self-assembly, Nanofabrication, Memory Devices, Energy Capture and Storage Materials	http://funnano.kaist.ac.kr	
Kim, Chun-Gon Dept. of Aerospace Engineering, Professor	KAIST, Aeronautical Engineering, Ph.D. 1987	Smart Composites, Stealth Structures	http://smartech.kaist.ac.kr	
Kim, Sang Ouk Dept. of Materials Science & Engineering, Professor	KAIST, Chemical Engineering, Ph.D. 2000	Soft Nanomaterials, Carbon Nanotubes & Graphene, Energy & Catalysis	http://snml.kaist.ac.kr	
Kim, Sang Youl Dept. of Chemistry, Professor	Rensselaer Polytechnic Institute, Chemistry, Ph.D. 1989	New Polymerization Reactions and Methods, Polymeric Materials with controlled Architecture, Design & Synthesis of Functional Macromolecules	http://macro.kaist.ac.kr	
Kim, Shin-Hyun Dept. of Chemical & Biomolecular Engineering, Associate Professor	KAIST, Chemical & Biomolecular Engineering, Ph.D. 2009	Functional Microparticles, Soft Microcapsules, Soft Photonic Materials	http://isml.kaist.ac.kr	
Kim, Taek-Soo Dept. of Mechanical Engineering, Associate Professor	Stanford Univ., Mechanical Engineering, Ph.D. 2010	Graphene, Microelectronics, Fuel Cells, Solar Cells, Flexible Electronics, Thin Films	http://aptf.kaist.ac.kr	
Lee, Hansuek Graduate School of Nanoscience and Technology, Assistant Professor	Seoul Nat'l Univ., Electrical Engineering, Ph.D. 2008	Light Matter Interactions and Opto-mechanics in Nano-Structures and their Applications	https://sites.google.com/site/ hleelab/	
Lee, Hee Chul Dept. of Electrical Engineering, Professor	Tokyo Institute of Technology, Electronic Engineering, Ph.D. 1989	Semiconductors, Infrared Detectors, Ferroelectric RAM, High Dielectric Thin Film	http://irislab.kaist.ac.kr	
Lee, Hyuck Mo Dept. of Materials Science and Engineering, Professor	MIT, Metallurgy, Ph.D. 1989	Alloy Phase Equilibria, Application of Nanomaterials	http://triangle.kaist.ac.kr	
Lee, lk Jin Dept. of Mechanical Engineering, Associate Professor	Univ. of lowa, Mechanical Engineering, Ph.D. 2008	Reliability-Based Design Optimization(RBDO), Reliability-Based Robust Design Optimization(RBRDO), System Reliability Analysis and Design Optimization	http://idol.kaist.ac.kr/	
Lee, Jhinhwan Dept. of Physics, Assistant Professor	Seoul Nat'l Univ., Physics, Ph.D. 2002	Scanning Probe Microscopies Strongly Correlated Electron Systems Nanoscale and Low Dimensional Electron Systems	http://ltspm.kaist.ac.kr	
Lee, Keon Jae Dept. of Materials Science & Engineering, Associate Professor	Illinois Univ., Materials Science & Engineering, Ph.D. 2006	Self-powered Flexible Energy, Flexible Large Scale Integration, Flexible Optoelectronics, Laser Material Interaction	http://fand.kaist.ac.kr	
Oh, IlKwon Dept. of Mechanical Engineering, Professor	KAIST, Mechanical Engineering, Ph.D. 2001	Actuators, Transducers & Artificial muscles, Graphene & Nano-Engineering	http://sdss.kaist.ac.kr	
Park, Byong Guk Dept. of Materials Science & Engineering, Associate Professor	KAIST, Materials Science & Engineering, Ph.D. 2003	Magnetic Materials, Spintronic Devices, Magnetic Memory(MRAM)	http://nanospin.kaist.ac.kr	

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Education	Research Interests	Website Remark
Stanford Univ., Chemical Engineering, Ph.D. 1985	Optoelectronic Devices, Colloidal Crystals & Soft Lithography, Metal Nanocrystals	http://stereo.kaist.ac.kr
Stanford Univ., Physics, Ph.D. 2011	Mechanics and Materials Science at Nanoscale, Development of Multiscale Simulation Methods, Interaction of Chemistry and Mechanics	https://sites.google.com/site/ seunghwalab
KAIST, Physics, Ph.D. 2009	Surface Plasmon based Sub-wavelength Optics, Electrically Activated Surface Plasmonic Devices, Optical Antennas for Near-field Optics	http://swol.kaist.ac.kr
KAIST, Chemistry, Ph.D. 2008	Polymer Synthesis	http://nanopsg.kaist.ac.kr
Stanford Univ., Electrical Engineering, Ph.D. 2008	Nanophotonics, Metamaterials, Energy and Information Devices	http://apmd.kaist.ac.kr
POSTECH, Physics, Ph.D. 2005	Complex Oxide Heterostructures, Multiferroics	http://oxide.kaist.ac.kr
Univ. of Michigan, Electrical Engineering, Ph.D. 1994	Fabrication, modeling, and characterization of high-speed, high-functionality nanoscale devices and their integration into digital/analog/RF micro-/ millimeter-wave, THz, Optoelectronic quantum-effect integrated circuits & neuromorphic nanosystems	http://hsnl.kaist.ac.kr
Univ. of Arizona, Optical Sciences, Ph.D. 2005	OLEDs for Display and Lighting, OPVs for Energy Havesting, OTFTs for Integrated Printed Electronics, Vapor Jet Printing for Low-cost Printed Electronics	http://ioel.kaist.ac.kr
KAIST, Chemical & Biomolecular Engineering, Ph.D. 2007	Novel Bio-vehicles and Organic Nanodevices including Photovoltaics, OLED, etc., Soft Nanomaterials; Liquid Crystals, Supramolecules, Polymers, Particles, etc.	http://yoon.kaist.ac.kr
Stanford Univ., Electrical Engineering, Ph.D. 2004	Nanophotonics, Optoelelctronics, MEMS	http://yu.kaist.ac.kr
MIT, Materials Scienceand Engineering, Ph.D. 2013	Macromolecule theory, Self-assembly	http://nanocentury.kaist.ac.kr
	EducationStanford Univ., Chemical Engineering, Ph.D. 1985Stanford Univ., Physics, Ph.D. 2011KAIST, Chemistry, Ph.D. 2009KAIST, Chemistry, Ph.D. 2008Stanford Univ., Electrical Engineering, Ph.D. 2008POSTECH, Physics, Ph.D. 2005Univ. of Michigan, Electrical Engineering, Ph.D. 2005Univ. of Arizona, Optical Sciences, Ph.D. 2005Viv. of Arizona, Optical Sciences, Ph.D. 2005KAIST, Chemical & Biomolecular Engineering, Ph.D. 2007Stanford Univ., Electrical Engineering, Ph.D. 2005MIT, Materials Scienceand Engineering, Ph.D. 2013	EducationResearch InterestsStanford Univ., Chemical Engineering, Ph.D. 1985Optoelectronic Devices, Colloidal Crystals & Soft Lithography, Metal NanocrystalsStanford Univ., Physics, Physics, Ph.D. 2011Mechanics and Materials Science at Nanoscale, Development of Multiscale Simulation Methods, Interaction of Chemistry and MechanicsKAIST, Chemistry, Ph.D. 2009Surface Plasmon based Sub-wavelength Optics, Electrically Activated Surface Plasmonic Devices, Optical Antennas for Near-field OpticsKAIST, Chemistry, Ph.D. 2008Polymer SynthesisStanford Univ., Electrical Engineering, Ph.D. 2008Nanophotonics, Metamaterials, Energy and Information DevicesPOSTECH, Physics, Ph.D. 2005Complex Oxide Heterostructures, MultiferroicsUniv. of Michigan, Electrical Engineering, Ph.D. 2005Fabrication, modeling, and characterization of high-speed, high-functionality nanoscale devices and their integration into digital/analog/RF mitors/ milimeter-wave, THz, Optoelectronic quantum-effect integrated circuits & neuromophic nanosystemsUniv. of Arizona, Optical Sciences, Ph.D. 2007OLEDs for Display and Lighting, OPYs for Energy Havesting, OTFs for Integrated Printed ElectronicsKAIST, Chemical & Biomolecular Engineering, Ph.D. 2007Novel Bio-vehicles and Organic Nanodevices including Photovoltaics, OLED, etc., Soft Nanomaterials; Liquid Crystals, Supramolecules, Polymers, Particles, etc.KAIST, Chemical & Biomolecular Engineering, Ph.D. 2007Novel Bio-vehicles and Organic Nanodevices including Photovoltaics, OLED, etc., Soft Nanomaterials; Liquid Crystals, Supramolecules, Polymers, Particles, et

KAIST Institute for Health Science and Technology

• Research Area(Neuroimaging and Neuromodulation)

Name	Education	Research Interests	Website	Remark
Jeong, Yong Dept. of Bio and Brain Engineering, Associate Professor	Yonsei Univ., Neurophysiology, Ph.D. 1997	Brain Science, Clinical Neuroscience, Neuroimaging	http://ibrain.kaist.ac.kr	Director
Bae, Hyeon-Min School of Electrical Engineering, Associate Professor	Univ. of Ilinois, Electrical Engineering, Ph.D. 2004	Near infrared spectroscopy, Ultrasound, Renal denervation	http://nais.kaist.ac.kr	
Chang, Jae-Byum Dept. of Materials Science & Engineering, Assistant Professor	MIT, Materials science and engineering, Ph.D. 2014	Super-resolution molecular imaging, Brain science and neuroscience, Polymer and hydrogel engineering	https://sites.google.com/site/ jbchang03/	

	Education	Research Interests	Website	Remark
Cho, Seungryong Dept. of Nuclear and Quantum Engineering, Associate Professor	Univ. of Chicago, Medical Physics, Ph.D. 2009	Medical imaging, Image-guided therapy, Tomographic image reconstruction	http://mirlab.kaist.ac.kr/	
Hwang, Sung Ju School of Computing, Assistant Professor	Univ. of Texas at Austin, Computer Science, Ph.D. 2013	Al-Information Service	http://www.sungjuhwang.com/	
Jeong, BumSeok Graduate School of Medical Science and Engineering, Associate Professor	Ulsan Univ., College of Medicine, Psychiatry, Ph.D. 2002	Clinical Neuroscience, Neuroimaging, Neuromodulation	https://sites.google.com/site/ kaistclinicalneurosciencelab/	
Kim, Daesoo Dept. of Biological Sciences, Professor	POSTECH, Genetics and Neuroscience, Ph.D. 1998	Behavior, Neurological disorders, Optogenetics	https://sites.google.com/site/ bglabkorea/	
Lee, Hyunjoo Jenny School of Electrical Engineering, Assistant Professor	Stanford University, Electrical Engineering, Ph.D. 2012	Brain ultrasound modulation, Neural probe, Biosensors	http://bmm.kaist.ac.kr	
Lee, Sang Wan Dept. of Bio and Brain Engineering, Assistant Professor	KAIST, Electrical Engineering, Ph.D. 2009	Neuroimaging, Computational neuroscience, Brain-inspire Al	http://aibrain.kaist.ac.kr	
Paik, Se-Bum Dept. of Bio and Brain Engineering, Assistant Professor	Univ. of California at Berkeley, Physics, Ph.D. 2009	Model Neural Network, Computational Systems Neuroscience, Visual System	http://vs.kaist.ac.kr/	
Park, Jinah School of Computing, Associate Professor	Univ. of Pennsylvania, Computer and Information Science, Ph.D. 1996	Medical Image Data Analysis and Visualization, Virtual Reality and Interaction	http://cgv.kaist.ac.kr/	
Park, Sung-Hong Dept. of Bio and Brain Engineering, Associate Professor	Univ. of Pittsburgh, Bioengineering, Ph.D. 2009	Magnetic resonance imaging, Neuroimaging, Medical imaging	http://mri.kaist.ac.kr/	
Ye, JongChul Dept. of Bio and Brain Engineering, Professor	Purdue Univ., Electrical Engineering, Ph.D. 1999	Inverse Problems, Medical Imaging (MRI, CT, Optics, Ultrasounds, DOT, etc.), Deep Neural Network	http://bispl.weebly.com/	

• Research Area(Biophotonics)

	Education	Research Interests	Website	Remark
ho, Eun Seon lept. of Chemical and Biomolecular ngineering, ssistant Professor	Massachusetts Institute of Technology, Materials Science (Polymer Science), Ph.D. 2013	Design and Synthesis of Functional Hybrid Nanomaterials, Energy and Environmental Application	https://fhnl.kaist.ac.kr	
eon, Jessie Sungyun lept. of Mechanical Engineering, ssistant Professor	MIT, Mechanical Engineering, Ph.D. 2014	Microfluidics, Organ-on-a-chip, Disease-on-a-chip	http://jeon.kaist.ac.kr/	
eong, Ki-Hun lept. of Bio and Brain Engineering, rofessor	Univ. of California, Berkeley, Mechanical Engineering, Ph.D. 2005	Functional Cameras and Microscopes for In vivo Biomedical Imaging, Optical Healthcare Sensors for Continuous Biomonitoring, Biophotonic sensors for Liquid Biopsy	http://biophotonics.kaist.ac.kr/	
:im, Pilhan iraduate school of Nanoscience & echnology, ssociate Professor	Seoul Nat'l Univ., Electrical Engineering, Ph.D. 2005	Bio-imaging, Intravital microscopy, Cellular-level flurescence imaging	http://ivmvl.kaist.ac.kr	
iim, YeuChun lept. of Chemical and Biomolecular ngineering, ssociate Professor	Georgia Institute of Technology, Chemical and Biomolecular Engineering, Ph.D. 2007	Biomedical device, Drug delivery, Cancer therapy	http://bmnd.kaist.ac.kr	
im, Yoosik lept. of Chemical and Biomolecular ngineering, ssistant Professor	Princeton Univ., Chemical and Biological Engineering, Ph.D. 2011	Quantitative Imaging, Bioinformatics, RNA Biology	https://qcbio.wordpress.com/home	

Research Highlights Research Achievements

Faculty Information

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Name	Education	Research Interests	Website	Remark
Oh, Wangyuhl Dept. of Mechanical Engineering, Associate Professor	KAIST, Physics, Ph.D. 1997	Biomedical photonic imaging, Optical coherence tomography	http://bpil.kaist.ac.kr/	
Park, YongKeun Dept. of Physics, Associate Professor	Harvard-MIT Health Science and Technology, Medical Physics and Medical Engineering, Ph.D. 2010	Bioimaging, Holography, Cellular imaging	https://bmol.kaist.ac.kr	
Yoon, Young-Gyu School of Electrical Engineering, Assistant Professor	MIT, Electrical Engineering and Computer Science, Ph.D. 2018	Neuro-engineering, Brain imaging, Biomedical signal processing	http://www.nicalab.com/	

• Research Area(Therapeutic Bioengineering)

Name	Education	Research Interests	Website F	Remark
Chung, HyunJung Graduate school of Nanoscience & Technology, Assistant Professor	KAIST, Biological Sciences, Ph.D. 2010	Nanomedicine, Molecular diagnostics, Drug delivery	http://nanomedicine.kaist.ac.kr	
G.Churchill, David Dept. of Chemistry, Professor	Columbia Univ., Chemistry, Ph.D. 2002	Neurodegenerative disease research, Dementia, Bioinorganic chemistry	http://churchill.kaist.ac.kr	
Kang, Seung-Kyun Dept. of Bio and Brain Engineering, Assistant Professor	Seoul Nat'l Univ., Materials Science and Engineering, Ph.D. 2012	Therapeutic implantable devices, Biodegradable sensors, Regenerative electronics	http://bielab.kaist.ac.kr/	
Kim, Pilnam Dept. of Bio and Brain Engineering, Associate Professor	Seoul Nat'l Univ., Mechanical Engineering, Ph.D. 2009	Organ-on-a-chip, In vitro disease model, Implantable/Injectable scaffold	http://www.pilnam.kaist.ac.kr/	
Lee, Heung-Kyu Graduate School of Medical Science and Engineering, Associate Professor	Yale Univ., Immunobiology, Ph.D. 2009	Mucosal immunology, Antigen recognition and presentation	-	
Lee, Wonhee Graduate school of Nanoscience & Technology, Associate Professor	California Institute of Technology, Applied Physics, Ph.D. 2008	Tissue engineering, Biosensor, Microfluidic cell manipulation	http://mfbsl.kaist.ac.kr/	
Nam, Yoonkey Dept. of Bio and Brain Engineering, Associate Professor	Univ. of Illinois at Urbana-Champaign(UIUC), Electrical Engineering, Ph.D. 2005	Neural microsystems and instrumentation, Neuron-on-a-chip, Neural cell patterning	http://neuros.kaist.ac.kr/	
Park, Je-Kyun Dept. of Bio and Brain Engineering, Professor	KAIST, Biotechnology, Ph.D. 1992	Healthcare Devices, Organ function-on-a-chip, 3D cell culture and Assays	http://nanobio.kaist.ac.kr/	
Park, Ji Ho Dept. of Bio and Brain Engineering, Associate Professor	Univ. of California, San Diego, Materials Science, Ph.D. 2009	Biomaterials, Drug Delivery, Nanomedicine	http://openwetware.org/wiki/ Park_Lab	
Shin, Eui-Cheol Graduate School of Medical Science and Engineering, Professor	Yonsei Univ., Microbiology & Immunology, Ph.D. 2001	Virology, Immunology, Cancer	http://web.kaist.ac.kr/~liid	

• Research Area(Smart Healthcare)

Name		Research Interests	Website	Remark
Lee, Jae-Gil Dept. of Industrial & Systems Engineering, Associate Professor	KAIST, Computer Science, Ph.D. 2005	Big Data Analysis, Spatio-Temporal Data Mining, Stream Data Mining	http://dm.kaist.ac.kr/	
Lee, Uichin Dept. of Industrial & Systems Engineering, Associate Professor	UCLA, Computer Science, Ph.D. 2008	Human-Computer Interaction(HCI), Ubiquitous Computing, Data Science	https://iclab.kaist.ac.kr/	

Name	Education	Research Interests	Website	Remark
Lee, Soo-Young KI for Artificial Intelligence, Visiting Professor	Polytechnic Institute of New York(later merged to NYU), Electrophysics, Ph.D. 1984	Artificial Intelligence, Learning Algorithm, Speech and Conversational Agents	http://cnsl.kaist.ac.kr	Director
Choi, Key-Sun School of Computing, Professor	KAIST, Computer Science, Ph.D. 1986	Natural Language Processing, Machine Reading, Semantic Web	http://semanticweb.kaist.ac.kr/	
Jeong, Bumseok Graduate School of Medical Science and Engineering, Associate Professor	Ulsan Univ. College of Medicine, Psychiatry, Ph.D. 2002	Clinical Neuroscience, Neuroimaging, Neuromodulation	https://sites.google.com/site/ kaistclinicalneurosciencelab/	
Lee, Ji-Hyun Graduate School of Culture Technology, Associate Professor	CMU, Computational Design, Ph.D. 2002	Computational Design, Al in Design, Information-Based Design	https://www.ibdsite.com/	
Myaeng, Sung-Hyon School of Computing, Professor	Southern Methodist Univ., Computer Science and Engineering Ph.D. 1987	Text Mining, Question Answering, Natural Language Processing	http://ir.kaist.ac.kr	
Noh, Junyong Graduate School of Culture Technology, Professor	Univ. of Southern California, Computer Science, Ph.D. 2002	Character/Facial Animation, Image/Video Manipulation, Immersive Display	http://vml.kaist.ac.kr/	
Oh, Alice School of Computing, Associate Professor	MIT, Electrical Engineering and Computer Science, Ph.D. 2008	Machine Learning, Natural Language Processing, Social Media Analysis	http://uilab.kr/	
Whang, Euijong School of Electrical Engineering, Assistant Professor	Stanford Univ., Computer Science, Ph.D. 2012	Big Data-Al Integration, Big Data Analytics, Big Data Systems	http://stevenwhang.com	

• Research Area(AI Applications)

• Research Area(AI Fundamentals)

Name	Education	Research Interests	Website	Remark
Cho, Seungryong Dept. of Nuclear & Quantum Engineering, Associate Professor	The Univ. of Chicago, Medical Physics, Ph.D. 2009	Deep leearning applications in Medical imaging, Radiation therapy, Nondestructive testing	http://mirlab.kaist.ac.kr/	
Kim, Sung Yong Dept. of Mechanical Engineering, Assistant Professor	Univ. of California, San Diego/ Scripps Institution of Oceangraphy, Oceanography(Applied Ocean Science), Ph.D. 2009	Environmental fluid dynamics, Machine learning and inverse methods, Environmental big dat aanalysis	http://efml.kaist.ac.kr/	
Kwon, Dong-Soo Dept. of Mechanical Engineering, Professor	Georgia Institute of Technology, Mechanical Engineering, Ph.D. 1991	Surgical robot, Human-Robot Interaction, Haptics	http://robotforsurgical.cafe24. com/	
Lee, Hyuck Mo Dept. of Materials Science and Engineering, Professor	MIT, Metallurgy, Ph.D. 1989	Electrochemical Catalyst, CALPHAD(Thermodynamic calculation), Materials Discovery using Machine Learning	http://triangle.kaist.ac.kr/	
Lee, Jae Woo Dept. of Chemical and Biomolecular Engineering, Professor	Carnegie Mellon Univ., Chemical Engineering, Ph.D. 2000	CO ₂ Conversion to valuable carbon materials, Energy efficient design, Process intensification	http://efdl.kaist.ac.kr/	
Lee, Jae-Gil Dept. of Industrial and Systems Engineering, Associate Professor	KAIST, Computer Science, Ph.D. 2005	Big Data Analysis, Spatio-Temporal Data Mining, Stream Data Mining	http://dm.kaist.ac.kr/	
Lee, Jay Hyung Dept. of Chemical and Biomolecular Engineering, Professor	California Institute of Technology, Chemical Engineering, Ph.D. 1991	Reinforcement Learning based Multi-scale Multi-stage Desicion Making Strategy, Deep Learning based Function Approximation and Model Estimation, Design and Optimization of Sustainable System	http://lense.kaist.ac.kr/	

Research Highlights

Research Achievements

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Name	Education	Research Interests	Website Remai
Lee, Sang Yup Dept. of Chemical and Biomolecular Engineering, Professor	Northwestern Univ., Chemical Engineering, Ph.D. 1991	Biotechnology, Metabolic engineering, Systems biology	http://mbel.kaist.ac.kr
Lim, Youn-kyung	Illinois Institute of Technology,	Human-computer interaction,	http://cixd.kaist.ac.kr/
Dept. of Industrial Design,	Institute of Design,	User experience design,	
Associate Professor	Ph.D. 2003	Smart home	
Myung, Hyun	KAIST,	Autonomous robot navigation,	http://urobot.kaist.ac.kr/
School of Electrical Engineering,	Electrical Engineering,	Object/behaviour recognition,	
Professor	Ph.D. 1998	Bio-inspired neural networks	
Park, HyunWook	KAIST,	Medical Imaging,	http://athena.kaist.ac.kr/
School of Electrical Engineering,	Electrical Engineering,	Video Processing,	
Professor	Ph.D. 1988	MRI	
Park, Yong-Hwa	KAIST,	3D Vision Recognition,	http://human.kaist.ac.kr/
Dept. of Mechanical Engineering,	Mechanical Engineering,	Voice Recognition,	
Associate Professor	Ph.D. 1999	Biometric Recognition	
Ro, Yong Man	KAIST,	Deep learning in computer vision and image	http://ivylab.kaist.ac.kr
School of Electrical Engineering,	Electrical Engineering,	processing(2D, 3D, VR),	
Professor	Ph.D. 1992	Medical imaging	
Shin, Jonghwa Dept. of Materials Science and Engineering, Associate Professor	Stanford Univ., Electrical Engineering, Ph.D. 2008	Metamaterials, Photonics, Artificial Intelligence-Based Designs	http://apmd.kaist.ac.kr
Ye, Jong Chul	Purdue Univ.,	Deep learning for image reconstruction,	http://bispl.weebly.com/
Dept. of Bio and Brain Engineering,	Electronics Engineering,	Medical imaging,	
Professor	Ph.D. 1999	Biomedical signal processing	

• Research Area(Al Emergings)

Name	Education	Research Interests	Website
Cho, Young-Ho	Univ. of California at Berkeley,	Emotion Monitoring Skin Patches,	http://mems.kaist.ac.kr/
Dept. of Bio and Brain Engineering,	Micro Electo Mechanical Systems(MEMS),	Physiological Emotion Symptoms,	
Professor	Ph.D. 1990	Emotion Evaluation Criteria	
Chung, Hye Won	MIT,	Data Science,	http://iids.kaist.ac.kr
School of Electrical Engineering,	Electrical Engineering and Computer Science,	Information Theory,	
Assistant Professor	Ph.D. 2014	Statistical Inference	
Jo, Sungho	MIT,	Robotic Intelligence,	http://nmail.kaist.ac.kr/
School of Computing,	Electrical Engineering and Computer Science,	Augmented Intelligence,	
Associate Professor	Ph.D. 2006	Neuro-Machine Intelligence	
Kim, Daesoo Dept. of Biological Sciences, Professor	POSTECH, Genetics and Neuroscience, Ph.D. 1995	Optogenetics, Animal behavior, Brain-machine interface	https://sites.google.com/site/ bglabkorea/
Lee, Keon Jae Dept. of Materials Science and Engineering, Professor	Univ. of Illinois at Urbana-Champaign, Materials Science and Engineering, Ph.D. 2006	loT sensor, Flexible electronic device	http://fand.kaist.ac.kr/
Lee, Phill-Seung	MIT,	Computational mechanics,	http://cmss.kaist.ac.kr/
Dept. of Mechanical Engineering,	Civil and Environmental Engineering,	Structural engineering,	
Associate Professor	Ph.D. 2004	Brain stimulation	
Lee, Sang Wan	KAIST,	Computational neuroscience,	http://aibrain.kaist.ac.kr/
Dept. of Bio and Brain Engineering,	Electrical Engineering,	Brain-inspired AI,	
Assistant professor	Ph.D. 2009	Neuroimaging	

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Name	Education	Research Interests	Website	Remark
Rhee, June-Koo Kevin School of Electrical Engineering, Professor	Univ. of Michigan, Ann Arbor, Electrical Engineering, Ph.D. 1995	Quantum Computing, Quantum Machine Learning, Quantum Information	http://quic.kaist.ac.kr	

• Research Area(CO₂ conversion)

		Research Interests		Remark
L ee, Jay H. Dept. of Chemical and Biomolecular Engineering, Professor	California Institute of Technology, Chemical Engineering, Ph.D. 1991	Model Predictive Control, Approximate Dynamic Programming, Production Scheduling	http://lense.kaist.ac.kr	Director
Cafer T. Yavuz Graduate School of EEWS, Associate Professor	Rice Univ., Chemistry, Ph.D. 2008	Exploring sustainable nano & porous materials chemistry for solutions to global challenges in the environment, particularly those related to water, CO ₂ , and methane	http://yavuz.kaist.ac.kr/	
lung, Heetae Dept. of Chemical engineering, Professor	Case Western Reserve Univ., Macromolecular Science & Engineering, Ph.D. 1998	Molecular Assembly, Opto-electronic Materials, Nanopatterning	http://ooem.kaist.ac.kr	
Jung, WooChul Dept. of Materials Science and engineering, Assistant Professor	Massachusetts Institute of Technology, Materials Science, Ph.D. 2010	Solar Fuels, Fuels Cells, Electro-catalysis	http://seml.kaist.ac.kr	
Jung, Yeon Sik Dept. of Materials Science and Engineering, Associate Professor	Massachusetts Institute of Technology, Materials Science and Engineering, Ph.D. 2009	Sub 10nm self assembly, Nano structure applications, Energy applications	http://funnano.kaist.ac.kr	
Jung, Yousung Graduate School of EEWS, Associate Professor	UC Berkeley, Chemistry, Ph.D. 2005	Atomistic materials design for CO ₂ capture and conversion, Energy storage materials, Computational methods developments	http://qchem.kaist.ac.kr	
Kim, Hyunwoo Dept. of Chemistry, Associate Professor	Univ. of Toronto, Chemistry, Ph.D. 2009	Organic Synthesis, Green Chemistry, Catalyst Development	http://mdos.kaist.ac.kr	
L ee, Bong J. Dept. Of Mechanical Engineering, Associate Professor	Georgia Institute of Technology, Mechanical Engineering, Ph.D. 2007	Thermal Radiation, Solar Energy Harvesting	https://sites.google.com/site/ kaisttrad/	
Lee, Doh Chang Dept. of Chemical and Biomolecular Engineering, Associate Professor	Univ. of Texas at Austin, Chemical Engineering, Ph.D. 2007	Photocatalysis, Quantum dot display, Self-assembly	http://dclee.kaist.ac.kr	
L ee, Hyunjoo Dept. of Chemical and Biomolecular Engineering, Associate Professor	California Instutute of Technology, Chemical Engineering, Ph.D. 2005	Fundamental Understanding of Catalysts, Applications for Energy and Environment	https://catmat.kaist.ac.kr/	
L ee, Yunho Dept. of Chemistry, Associate Professor	The Johns Hopkins Univ., Inorganic/Bioorganometallic, Ph.D. 2007	Inorganic/Bioorganometallic	http://sites.google.com/site/ yunholab/	
Seo, Myungeun Graduate School of Nanoscience and Fechnology, Associate Professor	KAIST, Chemistry, Ph.D. 2008	Chemistry, Polymer Science, Nanoscience	http://nanopsg.kaist.ac.kr	
Song, Hyunjoon Dept. of Chemistry, Professor	KAIST, Inorganic and Organometallic Chemistry, Ph.D. 2000	Plasmon Nanocrystals, Photochemical Catalysts, Electroactive Materials	http://small.kaist.ac.kr	

KAIST Institute	Research	Research	Faculty
Overview	Highlights	Achievements	Information

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• Research Area(CO₂ capture)

Name	Education	Research Interests	Website	Remark
Kim, Jihan Dept. of Chemical and Biomolecular Engineering, Associate Professor	Univ. of Illinois at Urbana-Champaign, Electrical Engineering, Ph.D. 2009	Molecular Simulations, Multi-scale Modeling, Materials Design	http://molsim.kaist.ac.kr	
Koh, Dong-Yeun Dept. of Chemical and Biomolecular Engineering, Assistant Professor	KAIST, Chemical & Biomolecular Engineering, Ph.D. 2013	Molecular Separations, Adsorption, Membranes	https://mmml.kaist.ac.kr	

• Research Area(CO₂ avoidance using efficiency improvement)

Name	Education	Research Interests	Website Remark
Bae, Joongmyeon Dept. of Mechanical Engineering, Professor	Imperial College, Material Science, Ph.D. 1996	Solid oxide fuel cell, Steam reforming, Autothermal reforming	http://fuelcell.kaist.ac.kr
Kim, Nam II Dept. of Mechanical Engineering, Associate professor	KAIST, Mechanical Engineering, Ph.D. 2001	Combustion theory(laminar flames), Mild combustion, Combustion application,	http://combustion.kaist.ac.kr
Lee, Jeong Ik Dept. of Nuclear and Quantum Engineering, Associate Professor	Massachusetts Institute of Technology, Nuclear Science and Engineering, Ph.D. 2007	Nuclear enegy and system engineering, Power conversion and propulsion, Supercritical CO_2 power cycle	http://npnp.kaist.ac.kr
Park, Steve Dept. of Materials Science and engineering, Associate Professor	Stanford Univ., Materials Science & Engineering, Ph.D. 2014	Nanoelectronics, Printed Organic Electronics, Stretchable Electronics and Sensors, Bioelectronics	http://steveparklab.kaist.ac.kr
Shin, Byungha Dept. of Materials Science and Engineering, Associate Professor	Harvard Univ., Applied Physics, Ph.D. 2007	Perovskite Optoelectronics, Inorganic Chalcogenide Energy Devices, Photoelectrochemical Water Splitting	http://energymatlab.kaist.ac.kr/

• Research Area(CO₂ storage)

Name	Education	Research Interests	Website	Remark
Lee, H.K. Dept. of Civil and Environmental Engineering, Professor	Univ. of California, Los Angeles, Ph.D. 1998	Construction Materials, Structural Analysis	http://samlab.kaist.ac.kr	

• Others

Name	Education	Research Interests	Website	Remark
Bae, Choong Sik Dept. of Mechanical Engineering, Professor	Imperial College, Mechanical Engineering, Thermofluids, Ph.D. 1994	Internal Combustion Engine Combustion, Thermofluids Experiments, Laser diagnostics and instrumentation	http://engine.kaist.ac.kr	
Lee, Jae Woo Dept. of Chemical & Biomolecular Engineering, Professor	Carnegie Mellon Univ., Chemical Engineering, Ph.D. 2000	CO2 Conversion, H2 Storage, Biomass Conversion	http://efdl.kaist.ac.kr	

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KAIST Institute for the BioCentury	Lee, Jung Hee	042-350-4462
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KAIST Institute for Robotics	Park, Yuna	042-350-7139
KAIST Institute for the NanoCentury	Kim, Nu Ri	042-350-7271
KAIST Institute for Health Science and Technology	Kim, MiHyun	042-350-7164
KAIST Institute for Artificial Intelligence	Shin, Phil-Ho	042-350-8491
Saudi Aramco- KAIST CO2 Management Center	Kim, Jung Yi	042-350-8251
Fourth Industrial Revolution Intelligence Center (FIRIC)	Yun, Mihye	042-350-8671